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Editor - Captain H. GARBETT, R.N. (Retired),

To whom all communications should be addressed.

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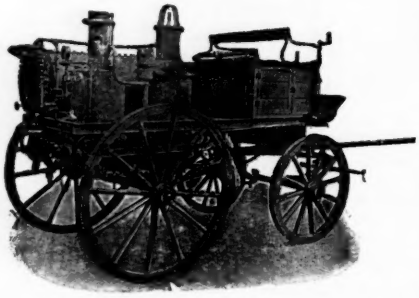

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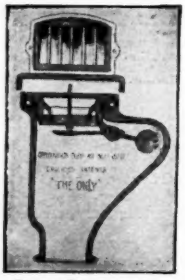

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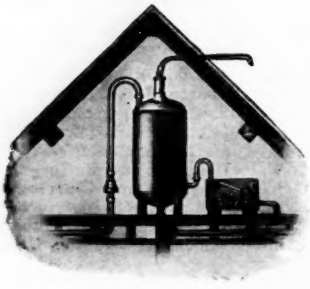

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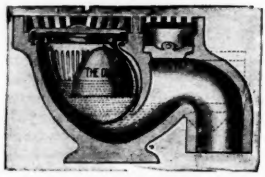

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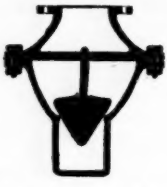

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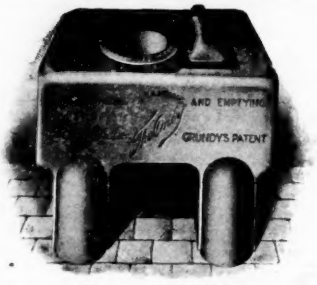

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17th	M. B. Selby-Smyth	Rifle Brigade	3,246
21st	H. F. P. Hornsby	Cornwall and Devon Miners Artillery	3,220
22nd	F. S. Whinney	Lincolnshire Regiment	3,217
27th	H. E. Hosking	East Surrey Regiment	3,128
30th	A. W. C. Richardson ...	West Yorkshire Regiment	3,098
32nd	J. D. Gilkison	Cheshire Regiment	3,067

ARMY QUALIFYING, SEPTEMBER, 1907.

THE FOLLOWING PASSED FROM US:—

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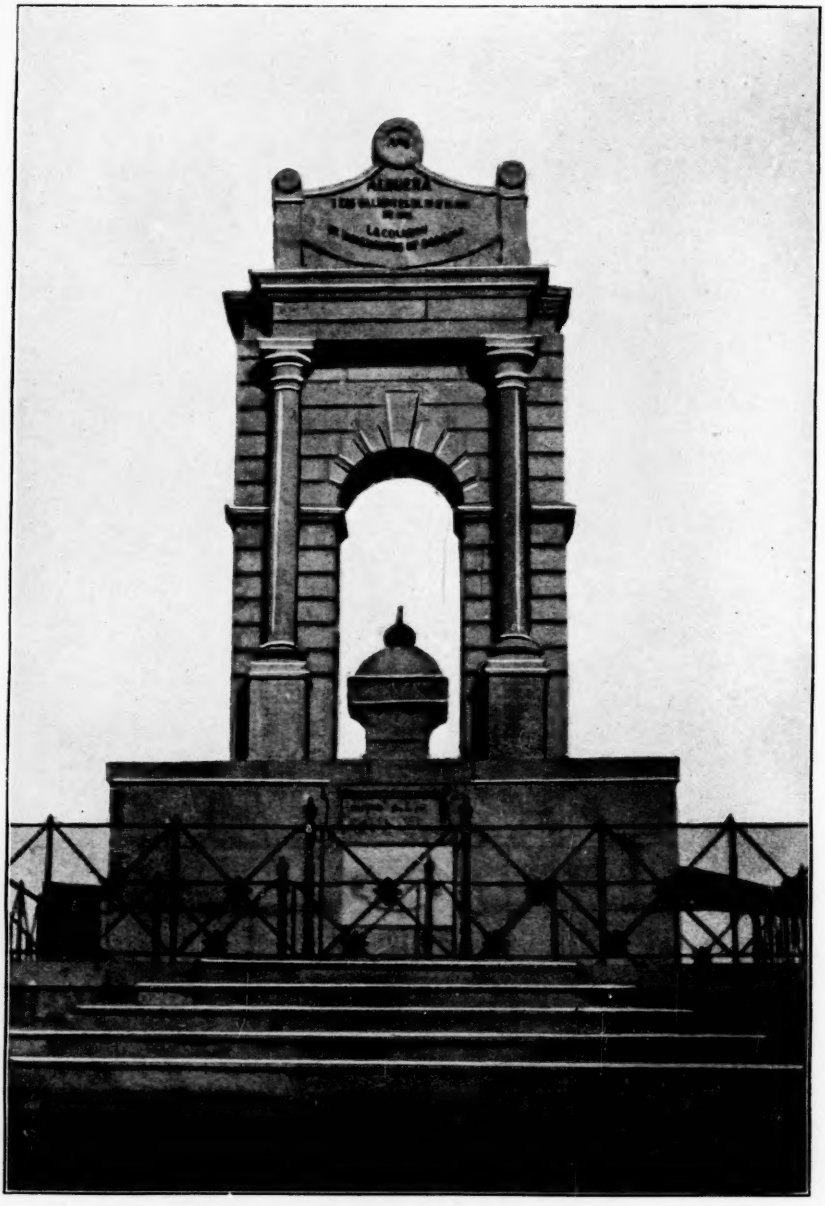

MONUMENT ERECTED IN THE TOWN OF ALBUERA TO COMMEMORATE THE BATTLE OF ALBUERA, 16th MAY, 1811.

For Description, see Page 305

CROSS CONFERRED BY SPANISH GOVERNMENT
IN COMMEMORATION OF THE
BATTLE OF ALBUERA.

See Page 307.

THE JOURNAL
OF THE
ROYAL UNITED SERVICE INSTITUTION.

VOL. LII. MARCH, 1908. No. 361.

[*Authors alone are responsible for the contents of their respective Papers.*]

SECRETARY'S NOTES.

1. ROYAL VISIT.

H.R.H. The Princess of Wales honoured the Institution by a visit to the Museum in the month of February.

2. THE COUNCIL.

At the Anniversary Meeting held on Tuesday, 3rd March, the following officers were appointed to the vacancies on the Council :—

Admiral Sir G. H. U. Noel, K.C.B., K.C.M.G.
Vice-Admiral Sir C. Campbell, K.C.M.G., C.B., D.S.O.
Rear-Admiral A. M. Field, F.R.S.
Captain E. J. W. Slade, M.V.O., A.D.C., R.N.
Lieut.-General H. D. Hutchinson, C.S.I.
Lieut.-General R. S. S. Baden-Powell, C.B.
Major-General Sir G. H. Marshall, K.C.B.
Brig.-General H. H. Wilson, D.S.O.
Colonel F. I. Maxse, C.V.O., C.B., D.S.O.
Colonel the Viscount Hardinge.
Lieut.-Colonel Hon. T. F. Fremantle, V.D.

3. MILITARY ESSAY, 1907.

The Gold Medal of the Institution, together with the first Trench-Gascoigne Prize of thirty guineas for the Military Essay, 1907, has been awarded to Lieut.-Colonel A. F. Mockler-Ferryman, Reserve of Officers, The second Trench-Gascoigne prize of twenty guineas has been given to Lieut.-Colonel C. E. D. Telfer-Smollett, Reserve of Officers. The Essay of Captain C. A. L. Yate, King's Own Yorkshire Light Infantry, was placed third by the referees. The subject of the Essay was :—

"The best way of organising and maintaining a Reserve of efficient British Officers for the British Forces at Home and in India, including the Indian Army."

The Referees were :—Lieut.-General H. D. Hutchinson, C.S.I. ; Colonel the Lord Raglan, C.B. ; Colonel Sir E. W. D. Ward, K.C.B., K.C.V.O.

4. The Annual Report and accounts, together with the proceedings of the Anniversary Meeting, will be issued with the April number of the JOURNAL.

5. OFFICERS JOINED.

The following Officers joined the Institution during the month of February :—

Captain H. D. Wilkin, D.S.O., R.N.
Captain C. J. C. Grant, Coldstream Guards.
Lieutenant The Viscount Gort, Grenadier Guards.
Lieutenant H. J. Pechell, 1st V.B. Hampshire Regiment.
Second Lieutenant H. C. Barnes, 4th Bn. Bedfordshire Regiment.
Lieut.-Colonel A. S. Sutherland-Harris, 4th Middlesex V.R.C.
Captain R. E. Kilvert, R.M.A.
Captain W. B. Hulke, Lincolnshire Regiment.

Captain H. E. ap R. Pryce, Indian Army.
Lieutenant A. M. Henderson-Scott, Royal Inniskilling Fusiliers.
S. Renaud, Esq., late Lieutenant Royal Inniskilling Fusiliers.
E. O. Sachs, Esq., late Lieutenant 2nd V.B. Middlesex Regiment.
Lieutenant W. G. Vyvyan, Royal Welsh Fusiliers.
Lieut.-Colonel the Lord Lovat, C.V.O., C.B., D.S.O., Lovat's Scouts. Imperial Yeomanry.
Captain C. L. Taylor, South Wales Borderers.
Second Lieutenant C. A. R. Scott, R.H.A.
Major-General C. F. Gregorie, C.B.
Captain J. W. Osborne, R.N. (retired).
Lieutenant C. F. Potter, R.F.A.
Second Lieutenant E. S. C. Grune, Bedfordshire Regiment.
Second Lieutenant W. R. C. Murray, Grenadier Guards.
Major H. Jellicorse, late Royal Sussex Regiment.
Second Lieutenant A. K. Mackenzie, Grenadier Guards.
Major J. H. Treasure, 1st Kent R.G.A. (Vols.).
Major A. Handley, late R.A.
Captain Hon. A. D. E. H. Boyle, M.V.O., R.N.
Captain B. R. Kirwan, R.F.A.
Sub-Lieutenant S. D. Spicer, R.N.
Captain A. Lash, Indian Army.
Lieutenant H. L. Wright, R.E.
Lieutenant E. Crawshay-Williams, Lancashire R.F.A. (M.).
Fleet-Surgeon H. Elliott, R.N.
Lieut.-Colonel T. K. E. Johnston, R.F.A.
Lieut.-Colonel F. J. Bonnalie, 1st Cheshire R.G.A. (Vols.).
Captain A. H. Bathurst, Royal Berkshire Regiment.
Second Lieutenant A. C. P. Hill, Indian Army.
Sub-Lieutenant L. A. Montgomery, R.N.
Captain R. H. Kearsley, 5th Dragoon Guards.

(No officer of the Royal Naval Reserve joined the Institution during the month.)

6. ARMY PROMOTION LECTURES.

1. Military History.
2. Military Law.
3. Administration and Organisation.

1. A course of ten lectures in Military History on the subjects set for the May Promotion Examinations will be given on Tuesdays and Fridays at 4 p.m., commencing on 10th April, the lecturer being Mr. J. H. Anderson, F.R.Hist. Soc., Barrister-at-Law.

2. A course of eight lectures in Military Law will be given on Mondays and Thursdays at 4 p.m., commencing on 13th April, the lecturer being Lieut.-Colonel F. J. Tidy.

3. A course of eight lectures in Administration and Organisation will be given on Mondays and Thursdays at 5.30 p.m., commencing on 13th April, the lecturer being Captain G. P. A. Phillips.

The fee for each course of lectures is one guinea for members of the Institution and two guineas for non-members.

Application to attend, enclosing the fee, to be addressed to the Assistant Secretary, Royal United Service Institution, Whitehall, S.W.

7. ADDITIONS TO THE MUSEUM.

a. The Gold Medal granted for the capture of Seringapatam on the 4th of May, 1799, awarded to Major Lang, commanding II. Division, 2nd Regiment of European Infantry.
Bequeathed by the late Mrs. M. C. Colls, of Monmouth.

b. A French soldier's Small-Book, picked up on the battle-field of Waterloo. *Given by Lieut.-Colonel Ralph Vivian.*

c. A Coloured Portrait of James Thomas, K.C.B., 7th Earl of Cardigan, Colonel 11th (Prince Albert's Own) Hussars. Commanded the Light Cavalry Brigade at the Battle of Balaclava, 25th October, 1854.
Given by Captain W. A. Tollemache, late 2nd Life Guards.

d. A Print in Colours, "The Highlanders," 1846.
Given by Colonel J. A. Man Stuart, C.B., C.M.G., Royal Body Guard of Scotland.

DESCRIPTION OF THE MONUMENT COMMEMORATING THE BATTLE OF ALBUERA, ERECTED IN THE TOWN OF ALBUERA.

By Major JOHN H. LESLIE, R.A. (Retired List).

ALBUERA is a small town in Spain in the province of Badajoz, situated about 12 miles to the S.E. of the city of that name.

On 16th May, 1811, was fought the battle of Albuera, by the allied Spanish, Portuguese, and British forces (about 30,000), under the command of Marshal Sir William Carr Beresford, against the French (about 23,000), under Marshal Soult. Wellington was not present.

It was one of the most desperate battles of the Peninsular War, and was brought on by Soult in his endeavour to relieve Badajoz, which was at that time being besieged by the Allies.

The French were defeated, and, in consequence, Badajoz was not relieved.

The battle was commemorated by the war medal, or, in the case of those already possessing the medal, by a clasp. The word "Albuera" was also authorised to be borne on the colours or appointments of the several regiments engaged.

In the year 1852, a monument to commemorate the battle was erected by the Spanish authorities in the Square of Albuera (see illustration). This illustration, which it is believed is new to England, is reproduced from a photograph, which has been specially taken for the writer by the present (1907) representative of Badajoz in the Spanish Cortes.

Its dimensions, approximately, are as follows:—

The plinth, 18 feet by 18; the base of the monument, 10 feet by 10; the arch, including the pillars, 6 feet by 5; the thickness of the arch, 2½ feet; the height, 22 feet.

The Spanish inscription on the monument is as follows. At the top:—

Año
de 1852.
Albuera.
A los valientes del 16 de Mayo
de 1811.
La Comision
De Monumentos de Badajoz.

At the base of the left pillar:—

"Generales Españoles. Castaños. Blake. Lardizabal. Ballesteros. Zayas. España. Penne."

At the base of the right one:—"Generales Anglo-Portugueses. Beresford. Stewart. Alten. Cole. Lumley. Hamilton."

On the tablet at the centre of the base:—"Mando en Jefe. Beresford."

The names of these officers in full are:—

Francisco Javier Castaños, Captain-General of the Spanish Army;
Joaquim Blake;
José de Lardizabal, Commanding the 1st Division, Spanish Army;
Francisco Ballesteros, Commanding the 2nd Division, Spanish Army;
José de Zayas, Commanding the 3rd Division, Spanish Army;
Carlo de España, Commanding the 4th Division, Spanish Army;
Conde de Penne Villemur, Commanding the Spanish Cavalry;

William Carr Beresford, Commanding the Portuguese Army;
The Hon. Wm. Stewart, Commanding the 2nd Division, British Forces;
Baron Charles Alten, Commanding the King's German Legion;
The Hon. Galbraith Lowry Cole, Commanding the 4th Division, British Forces;
The Hon. William Lumley, Commanding the Cavalry Division;
John Hamilton, Commanding the Portuguese Infantry.

The following letter about the monument was published in *The Times* of 11th November, 1890:—

"Sir,—Yesterday I had the melancholy pleasure of visiting the battle-field of La Albuera, a battle-field hallowed and for ever sacred to many a British hearth and home. On asking if there were anything which commemorated the Englishmen who had fallen in the heroic defence of a land which now bears to their countrymen little good will (I myself having been lately arrested, without the slightest grounds, for sketching old and dilapidated fortifications), I was shown on the *plaza* a monument in the last stage of decay. It is built of bricks overlaid with marble, and this latter is almost all either on the ground, or on the point of falling off. The piece which bears the words, "Mando en jefe, Beresford," is already cracking, and the lists of British and Spanish officers that are on the two upright columns are in a similar condition. (These two, it may interest some

readers to know, commence respectively with "Beresford, Alten, Stewart, Cole, and Castaños.")

"On making inquiries I found that the local *Ayuntamiento* felt deeply the disgrace of such a state of things, but that their finances would not allow them to undertake the restoration—an affair of some 2,000 *pesetas*.

"One has only to ride over the heights to the south-west of the village to imagine what the fire of the French batteries was like; and I thought that some of the families in England, who are proud to claim as their own those who fell under this same fire, would be grateful for this information, and would make it their business to see that the memory of those who died far from home and country is preserved on those sun-bleached Estremadura uplands where they lie—asleep.

"I am, Sir, yours truly,

"20th October. SIDNEY H. MOORE."

In commemoration of the battle a star was issued by the Spanish Government, in accordance with its usual custom,[1] a few of which were conferred upon British officers, including those serving with the Portuguese Army.

This decoration (see illustration), founded on 1st March, 1815, is a four-pointed star, with a small gold button on each point. Resting between the two upper points of the star is an enamelled wreath of laurel—green leaves on a gold ground—measuring three-quarters of an inch across. The star itself measures, from point to point across the centre, nearly an inch and a half.

The rays of the star are enamelled crimson, quite plain, with a gold edge, and gold flames issue forth from the angles between the rays of the star.

In the centre is an oval enamelled medallion, in the middle of which, on a white ground, is the cypher, "F R" in gold, signifying Fernando VII. Rex, King of Spain (restored May, 1814), encircled by a blue band with the word "Albuera" upon it in gold letters.

The ribbon—1 inch wide—is crimson, with light and dark blue borders.

The British regiments which were engaged in the battle, and which carry "Albuera" on their colours or appointments, are:—

Cavalry.

3rd Dragoon Guards, now styled 3rd Dragoon Guards.
4th Dragoons, now styled 4th Hussars.
13th Light Dragoons, now styled 13th Hussars.

Artillery.

"D" troop, R.H.A. (Captain George Lefebure's), now styled "V" Battery, R.H.A.[2]

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[1] More than fifty different stars were issued by the Spanish Government for the Peninsular War to commemorate, not only battles, sieges, and actions, but even the smallest and most trivial outpost affairs.

[2] "D" troop was reduced in 1816, and reformed as "V" battery R.H.A., in 1900.

Captain James Hawker's Company of the 4th Battalion, R.A., now styled No. 72 Company, Royal Garrison Artillery.

Infantry.

Regiments.	Designation in 1908.
3rd, 1st Battalion	The Buffs.
7th, 1st and 2nd Battalions ...	The Royal Fusiliers.
23rd, 1st Battalion	The Royal Welsh Fusiliers.
28th, 2nd ,, ...	The Gloucestershire Regiment.
29th, 1st ,, ...	The Worcestershire ,,
31st, 2nd ,, ...	The East Surrey ,,
34th, 2nd ,, ...	The Border ,,
39th, 2nd ,, ...	The Dorsetshire ,,
48th, 1st and 2nd Battalions ..	The Northamptonshire ,,
57th, 1st Battalion	The Middlesex ,,
60th, 5th ,, ...	The King's Royal Rifle Corps.
66th, 2nd ,, ...	The Royal Berkshire Regiment.

Should any of the "Albuera" Regiments care to have a copy or copies of the photograph of the monument, the writer will be very pleased to present them.

THE USE OF THE HORSE SOLDIER IN THE TWENTIETH CENTURY.

By Captain C. W. BATTINE, late 15th Hussars.

On Wednesday, 13th November, 1907.

The Right Hon. Sir CHARLES W. DILKE, Bart., M.P., in the Chair.

ALTHOUGH the twentieth century is not very old—in fact, still in its infancy—although it has hardly cut its teeth, yet two great wars have already shown how formidable those teeth are likely to be, how formidable are the weapons which are at the resources of civilised States, and how unwise it is to assume that the reign of peace on earth has begun. The events of these wars have shed considerable light on military matters, and have revived interest in the problems of military science, which naturally wanes during long periods of peace; and they have revived the controversy on many old subjects. Not the least of these problems is the future of the horse soldier. The widest divergence of view, as is well known, exists on that subject. Is he an anachronism rendered obsolete by the perfection of fire-arms, or is his *rôle* in war more important than ever?

There is a school which thinks that there is no further use for the horse on the battle-field except to pull carts, and there is the opposite school which thinks that the combined force of man and horse is still the most formidable weapon in the hands of a general. Both those opinions are eagerly put forward. I confess that as a cavalry soldier, and from all the experience I have been able to acquire by reading and by service, I am inclined to the latter view. In the war in Manchuria, on the one side there was a very formidable force of cavalry, but it was used with extraordinary supineness. On the other side there was a very small force, which gradually made itself felt. It was very small, at first not very wisely distributed; in fact, in the first great battle of the war, the battle of Liao-yang, it is said that the cavalry attached to the infantry divisions was split up to a considerable extent among the infantry corps, and we learn from an interesting history lately published that this cavalry was actually used to cook and carry the rations of the infantry into the battle-field. Although I think the House of Commons is extremely liberal in the supplies it votes for military purposes, I doubt myself whether they would consider it worth while to vote money to maintain 31 cavalry regiments, merely to cook and carry the food of infantry soldiers.

It is a remarkable thing that as time progresses the tendency of all armies in all ages is to cling to that which rapidly becomes

obsolete, such as the tactical formations, administrative regulations, ceremonies, and even clothes, while the eternal principles of strategy, which the experience of every fresh war tends to confirm, are forgotten. We cling with a loyalty that is positively touching to the Wellington boot, while we lightly discard many of the characteristics that made Wellington's army the most formidable in Europe. But if there is one principle in war that can be asserted with confidence it is this: the military force which possesses greater mobility than its adversary will win, unless markedly inferior in other respects; and in order to keep its ascendency in mobility a superiority of cavalry is absolutely essential. Infantry and artillery on the march are in an extremely vulnerable formation. As they move along the road they are easily stopped; the force which possesses a superiority in cavalry can hold up and delay the columns of the enemy, and so achieve superiority at the critical point.

The doctrine which I venture to put forward this afternoon for your consideration, and on which I challenge discussion, goes a step further. It is that Napoleon's dictum still holds good, in spite of mechanical inventions and modern treatises on tactics, *i.e.*, that cavalry should intervene *before*, *during*, *and after* the decisive collision; cavalry on the battle-field should deliver the knock-down blow whenever it gets the opportunity, and that opportunity will most certainly occur, if the commanders are watchful. Without its co-operation the manœuvres are impossible which bring about battle under favourable conditions, and in its absence there can be no destructive pursuit to reap the fruits of victory. Before the battle the long columns of troops, such as are necessarily employed in the huge armies of to-day, are very easily held up; their communications are easily interrupted; all sorts of annoyances and delays are easily inflicted by the side which can manœuvre round them with a superior force of cavalry. It may be worth while, perhaps, to remember the destructive powers which armies consisting almost entirely of cavalry have exerted in Europe. The invasions of the Huns, of the Normans, of the Slavs and the Saracens, carried conquest in front of them in a way that no other armies of mixed troops have ever done before or since. It is also worth while remembering that the only occasion upon which the people of the Continent conquered England, they did it with an army mainly composed of cavalry, and that the defence of England was entrusted to a superior fleet, which had the command of the sea, and to a great army of infantry.

In later days, as the science of war progressed, and as it became more expensive to maintain cavalry, and fewer people rode horses and ponies as a matter of course, the practice of armies was to combine the use of cavalry with the other arms. The inventor of modern war may be said to have been King Gustavus Adolphus of Sweden, and he also founded the combination of the three arms, which is still the practice of civilised armies. The Prussians under Frederick the Great played his system for all it was worth. Their great victories over the rather cumbrous, slow-moving armies of the Austrians, Russians, and French, were won in many cases by charges of huge masses of cavalry, which were opportunely directed against the flank of the hostile infantry. The cavalry attack was delivered in combination with the attack of extremely well-drilled infantry, but the decisive stroke came from the cavalry arm. After Frederick the

Great came Napoleon, who was the greatest manipulator of cavalry that has probably ever existed. He, of course, had the power to do as he wished, which gave him a great advantage over other generals; and in the victories with which he crushed Central Europe and established his Empire, he made use of the cavalry arm to its utmost extent. During the nineteenth century, with the general decadence of military science, cavalry suffered, and it was not until the American Civil War of 1861 that there was any revival of the use of cavalry. But the marvellous resistance put up by the Confederate States against the great resources of the North with their brave armies and persistent policy—for persistent policy counts for a great deal in war—was largely attributable to the assistance rendered by Stuart, a young man of twenty-seven years of age, at the head originally of but 6,000 horsemen, raised hastily on the plantations of the South. It was not until the superiority in mounted force had undoubtedly passed to the North that the Southern armies were cut off, beaten and forced to surrender.

No one reasonably supposes that the mere existence of a force of cavalry can ultimately affect the fate of a campaign between serious adversaries. The forces, whether mounted or dismounted, must possess destructive power; and it is argued that cavalry have not, in point of fact, destructive power, or have no destructive power in proportion to their cost, and to the trouble they are to the people who organise them, and to the space they take up on the line of march. I think that the whole history of war proves that the power of cavalry to inflict harm depends not on the armaments of either arm, either of cavalry or infantry, but on the skill of the leaders and on the conditions of the cavalry itself. It is no use expecting cavalry to accomplish great feats if the horses are dead-beat, or so beat, as in the Boer War, that they could hardly be kicked into a canter. The horse must be in a condition to gallop, and the men must be of the type that the best of our cavalry undoubtedly is, ready to face any odds they are called upon to face.

In support of that argument I should like to instance some of the great battles which have changed the course of history, and have settled the fate of nations for a long period. I will begin with a battle of our own domestic history, that separated the kingdom of Scotland from England, the battle of Bannockburn. That was won by a Norman knight, Robert the Bruce, with an army consisting almost entirely of Scottish infantry, over the English horsemen of the period. It must not be forgotten that this same English cavalry had only a few years before defeated Sir William Wallace, and utterly scattered his army of Scottish infantry. I argue that the victory at Bannockburn, that the turning of the tables, was the result of a great leader being in command of the infantry, and the cavalry being led by an incompetent one. One cannot go through the whole history of war, and so I must only take a few examples here and there. The next example I would take is the battle of Jena, perhaps the best of Napoleon's campaigns, where he utterly crushed the Prussians. The battle of Jena was fought on two battle-fields. The right wing of the French was engaged against a superior number of Prussians, and a largely superior force of Prussian cavalry, at any rate numerically superior; whereas the left wing of the French was engaged against an inferior force of

Prussians, and the mass of the French cavalry was with the left wing under Napoleon himself. On the right wing the Prussian cavalry attacked the French infantry, and were uniformly beaten off with great loss, they made no impression; whereas, on the left wing, the combined attack of the French with all three arms not only beat the Prussian Army off the field, but Murat, who led the French cavalry in pursuit, utterly destroyed the Prussian Army—not only the army in front of him, but also the army retreating from the other battle-field. The horsemen swept like a blizzard across the Prussian kingdom, capturing towns, cities, and fortresses, and putting an end to all organised resistance. It may be said that Murat's pursuit with 12,000 horsemen, after the battle of Jena, entirely put an end to the powers of resistance of an army of 150,000 men, and captured the strongholds of what has since become the most formidable military monarchy of the Continent. Taking the campaign of the Indian Mutiny, and the part played in it by General Havelock on his march to Lucknow, one sees the contrast of a force that is not provided with cavalry. General Havelock's column consisted of hardly more than 1,000 infantry, and he was opposed by an enormous numerical superiority of troops, which had been excellently trained, and which had repeatedly fought with great courage. On every occasion his men easily defeated the enemy, but he could not prevent them from rallying again and again to renew the resistance, because he had no cavalry with which to pursue, and no cavalry with which to interfere with their manœuvres.

Continuing the same line of argument, I would direct attention to the battle of Gettysburg, which I have called "The Crisis of the Confederacy." There the Southern States, failed to win a victory upon which their existence depended, because their cavalry, under Stuart, was raiding in the rear of the federal army, cutting communications, instead of combining on the battle-field for a decisive blow against the federal field forces.

Following shortly on the American Civil War there came the war between Prussia and Austria, where again the fate of a nation was decided in one day's fighting; and the hegemony of Germany, and with it of Central Europe, passed to Prussia at the battle of Sadowa. At Sadowa the two armies were, on paper, as near equal as possible, but the Prussians had superiority of leadership, and by the superior training and armament, their infantry gained a great victory. But the Prussians had a force of cavalry about 10,000 strong all told, of which they made absolutely no use. This cavalry skirmished with the enemy, but instead of attempting to intercept, or even delay, the retreat, they hung back and did little or nothing. If they had succeeded in delaying the retreat of the Austrian masses even for six hours, the defeat of that army would have been little less complete than the defeat of the French four years later at Sedan.

Next came the war of 1870, where, again, the fate of the campaign was practically decided in one day's fighting, on the 18th August, at Gravelotte, just outside Metz. The French Army, the Army of the Rhine so-called, had intended to retreat from Metz towards Paris, to unite with another army, which was being organised for the defence of the interior; but on the 16th August the German cavalry made a surprise attack on its marching columns, which so impressed the French General that he deployed for battle and lost the precious

hours in which he might have cleared off. That gave time to the Prussian infantry columns to come up, and to draw him into a serious engagement. After two days' hard fighting, Bazaine was driven back and invested in the fortress of Metz. Although the Prussians in the campaign of 1870 failed to make use of their cavalry to the extent they might have done, still, there is very little doubt but that their successful investment of Bazaine in the fortress of Metz, the principal event in the campaign, was due to the enterprising flank attack of a division of cavalry on the French marching columns.

Last of all, I come to Mukden, the great battle where the fate of Manchuria was sealed, and where the Japanese established their military ascendency. At Mukden the Japanese armies won a great victory, and inflicted enormous loss in men and material on their enemy. But the enemy retreated off the battle-field, and in a few weeks was in position to give battle again. Three or four months later, when the terms of peace came to be settled, the Russians were actually so strong that the Japanese were obliged to be content to sign a peace without the indemnity which they had intended to insist upon. It is not far wrong to say that the absence of an adequate force of Japanese cavalry from Mukden cost Japan her indemnity.

I would invite the attention of critics, who say that modern armaments, and the conditions of a modern battle-field give no chance to a mounted arm, to note some of those conditions. When two armies meet on the line of march, the first collision is usually somewhat in the nature of a surprise, unless one army is carefully entrenched, as the Russian armies were in the late campaign of Manchuria; then, if they are so entrenched, they can be fixed down in the entrenchments; the cavalry can move round their flanks as General French did round Cronje's flank at Magersfontein. They are more likely to come out and fight. Sticking to positions is fatal work; I do not think any general brought up in a modern school would attempt to do it. If he does it, his eventual destruction is pretty certain; he is more likely to come out and fight. The beginning of the fight is generally somewhat of a surprise. The side that is more adventurous, and pushes on first, will probably hurt itself, will probably knock up against something strong, and the deployment of the forces in the rear will be slow and gradual. As these forces deploy gradually, the lines of guns will come into action, and will fight at a distance of two to three miles apart. Under the screen provided by their fire, columns of infantry will come into action, and will gradually crawl up nearer to one another. The attacking side will utilise broken ground to approach the objectives that are assigned to it; and in doing so they will naturally avoid all open ground, because the open ground will be far more dangerous to cross; consequently, gaps will arise in the battle-field. This was so noticeable at Mukden that the line of battle, which originally was about 40 miles in length, extended to over 70 miles, and great gaps arose through which columns of troops might easily have passed without coming under fire at all. The Japanese had no cavalry in their line of battle to profit by these opportunities, otherwise they might have passed right through the Russian line and opened fire from behind on the Russian troops engaged in front.

There are other points which give a great advantage to the swift moving force of cavalry. The difficulty of withdrawing troops that

are once engaged, the very intensity of fire, and the extensions that are inevitable, make it most difficult to collect your men when once you have launched them in the line of battle. Practically, cavalry is the only arm that can open a fight and can get out of it without suffering heavy loss. The same applies in a less degree to artillery, but only because artillery fights at a great range. The uncertainty which prevails as to what is going on gives a great opportunity for bluff, and bluff is a very formidable weapon of the cavalry arm. You cannot tell exactly what forces you are being attacked with. As the bullets come on you, you cannot tell whether they are coming from infantry or cavalry, and the tendency, if you are attacked from an unexpected quarter, even in the bravest men, is to picture the worst. Consequently, a surprise attack, with all the bluff of the cavalry arm, has an enormous advantage which it never had before. In old days it had to come up so close that the surprise was very soon seen through, and the attacking force was discounted and accurately gauged.

Then, last of all, there is the rich prize to be won by a pursuit. The enormous masses of an army fall into confusion, which was formerly never seen on the battle-field. The retreat from Mukden was a spectacle that even the retreat from Leipzic did not approach in confusion and disaster, simply because these masses of men, who were pouring along one or two roads, became so unmanageable, and so utterly demoralised. They were so exhausted from the long days, during which they had been exposed to danger and want, that a scene of confusion arose, which rendered them easily a prey to a vigorous attack of cavalry. That attack never took place; but it assuredly might in future battles, if the cavalry were present, and led by an enterprising chief.

I think in this country there is some confusion of mind as to what really separates cavalry from infantry. We hear a lot of talk about mounted infantry, but I do not think anybody could really tell you what was the difference between a mounted infantry corps and a cavalry corps. Is it the possession of a rifle, because all cavalry now is armed with a rifle? Or is it the possession of a steel weapon that makes the difference? But, then, all infantry is armed with a steel weapon. I submit that the real difference between cavalry and infantry is the possession of a horse. The characteristics which infantry possess, and which give them their advantage over cavalry, are, that they can entrench and cling to ground. They gradually *pervade* the zone of combat by their superior numbers, by their superior volume of fire, by their greater defensive powers, and they can stay better. Now, the characteristics of cavalry, on the contrary, are, that they can get there first; they can snatch ground which is extremely valuable, and they can surprise. They can constantly open a fight and withdraw from it; they can choose and change their point of attack; they can bring up their men fresher, and with more ammunition, even if in smaller numbers. Consequently, their power at the beginning of a fight for a short time is greater than the power of infantry; whereas the power of infantry is eventually bound to be greater than the power of cavalry, if the fight is spun out. A very noticeable characteristic of the fighting in Manchuria, and, to a less extent, in South Africa, was that it was almost impossible to shoot

the enemy out of a position in which he really meant to stay; he eventually had to be charged; and the Japanese plan was generally to charge at night. They kept a heavy fire up during all the hours of daylight, and when night closed in, when the wretched defenders thought they had earned a few hours' rest, all of a sudden they heard the war whoop of the Japanese infantry, probably of the fresh reserves coming up from behind, and they would rush in and clear the place. If it had to be re-taken it had to be re-captured in the same way. No one disputes that cavalry has a far more formidable shock than infantry, and that if positions have to be taken by shock, cavalry can deliver that shock with greater power than infantry, always provided that the shock is speedily followed up by troops capable of defending it with fire power. But that shock must be delivered across ground, over which a horse can gallop; that is the cardinal necessity for cavalry action. No one who has studied battle-fields, and the country where war is likely to be waged, doubts that there will be much fighting on ground over which a horse can gallop. Moreover, only a certain number of the enemy's troops on the battle-field can deploy at any given time. Very large numbers are heaped about in columns, seeking cover where they can, and there are also deep columns on the road, trudging slowly and painfully to the point of action. Those are the targets against which a cavalry chief will attempt to direct his attacks. I believe that the shock tactics of cavalry are as much susceptible of improvement as the fire tactics of infantry. It is all very well to say that these attacks are difficult to deliver. So is everything in modern war. With the improvement in machinery, and what is perhaps more important, the improvement in men, everything has become more difficult, and if you are going to achieve anything in war you must do it better, a great deal better, than it used to be done.

There is a great deal of discussion to-day as to whether cavalry can be trained to do its work equally well on horse and on foot—whether it can perform the double *rôle* of fighting on foot and on horseback. I know that many Continental authorities, whose opinion is of great value, hold that the two or three years in which they have their men is insufficient to train them for the double *rôle*. If you had seen the recruits coming into the barrack yards as often as I have in France and Germany, you would readily understand their point of view. The marvel is that they can make cavalry soldiers of them at all. But our men with their long clean limbs, their innate love of riding, and the longer time that they have for the purpose of learning to ride, should not be daunted by the necessity of learning rather more than their Continental rivals; in fact, the whole position redounds extremely to our advantage. There is no doubt whatever, from the histories which are extant, that Marlborough's cavalry fought both on foot and horse, and the musket in those days was a complicated piece of machinery indeed, compared with the rifle with which we are armed; so that if they could do it we can. I think it will be generally conceded that surprise is the real weapon of the cavalry arm, and that a skilful use of that weapon will, in the future, give even greater results than it has in the past. The surprise attack in intimate combination with the other arms, in the way that Napoleon expected his cavalry leaders to act, will produce the same absolutely crushing effect that Murat's cavalry used to have on the armies of Austrians, Prussians, and Russians.

I would like to draw your attention for a moment to the different forces of cavalry which are maintained by the great nations in rivalry for the possession of what has come to be called world power. Taking the Power which, next to us, is probably the greatest, the United States, their permanent force of trained cavalry is very small; but there are, as the Civil War proved, all over the States of the Union, a very large number of men who are skilful riders and skilful revolver shots; and it would take only a very few weeks for the United States to put into the field 100,000 cavalry as good as the world has ever seen. Their military University, West Point, brings up a school of cavalry officers that would supply the higher commands, and a few weeks, or at any rate, a few months' practice, would develop a school of young leaders, who would give excellent results. I think the United States in three months would be able to put a force of cavalry in the field such as we should find it very difficult to beat. Taking the Continental Powers, the Russians have a very large force of cavalry permanently employed, but this force is pinned to their western frontier, and the detachments which were drawn from it for the war in Manchuria did not give a very good account of themselves, but there were special reasons to account for that. It is probable that a Power which fought Russia in Poland would have to fight against a very powerful force of cavalry indeed. The Germans maintain a force of about 50,000 cavalry, organised in brigades, which could very soon be greatly expanded; in fact, the organisation is complete in the German War Office, though it is not published, for forming them into divisions. These would form a force of about ten cavalry divisions, and they would be mobilised and on the move within forty-eight, and perhaps twenty-four hours, of the declaration of war. The French have a somewhat smaller force, but it is perhaps more highly organised even than the German, for it is organised in divisions in time of peace. The Austrians have also a very powerful force of cavalry. All the nations I have mentioned have a highly organised system of horse supply. They leave nothing to chance in their horse supply. They know that if there was a bitter war in which their national existence were involved, the horse supply would be a matter of vital importance, and they have not neglected it. America, Russia, Germany, Austria, and France have all great reserves of horses, and have a very complete machinery in time of peace for collecting those horses in time of war. It may be a surprise to many to hear that the Power which possesses in peace the most efficient cavalry forces is Great Britain. In the British Regular Army we have a force of 90 squadrons of regular cavalry—some 10,000 horsemen, of whom the rank and file are undoubtedly superior, and very far superior, to any other cavalry in the world. In addition to that we have a force of 20,000 Indian cavalry—I am taking low numbers; I am not taking estimates, but I am taking the numbers of men who I know can be horsed and sent into the field. These regiments of Indian cavalry are, according to good judges who have led them, little, if at all, inferior to European cavalry. Of course, they vary; some regiments are better than others, but taking the mass I think they are extremely good. Next we have a great number of Colonials, who have been accustomed to ride all their lives, who ride as easily without a saddle as with it, who can use fire-arms, and to whom it would be no trouble

at all to learn to use the lance. I daresay there would be no difficulty in raising 10,000 such men throughout the Colonies, and although they have no particular military discipline, except those men who served in the recent Boer War, still, in three months they would be as formidable soldiers as the Americans. Last of all there come our Yeomanry. I am not going to criticise the weak points of our Regular cavalry beyond saying this, that it has been an evil tradition with our military administration never to make use of them. This formidable force of cavalry, which would be a most trenchant argument in the hands of the British Government in any dispute with another Government, is used to garrison distant possessions of the Crown, but is not used to give a decisive blow in war. It is true there was a partial concentration of Regular cavalry in the South African War. Eighteen squadrons out of the 90 were present in the decisive action when Sir John French turned the Boer flank at Magersfontein, and of the 90 squadrons 9 were present at the decisive action at Paardeberg, the one tactical victory which knocked the stuffing out of the Boer resistance. Of course, I know that later on more regiments were sent into South Africa, but by that time the critical moment had passed, and they could only be used to hunt small parties of Boers about the veldt, and the great opportunity for delivering a knock-down blow with a mass of trained cavalry had vanished. I know it will be an answer that this cavalry is wanted for garrison duty, but my reply is: other countries also have weak districts to defend, and that what we suffer from in our military policy is that we cannot realise you *must* run some risks; that in order to win great victories you must *concentrate* your strength; you must leave some outlying districts to be, perhaps, temporarily overrun by the enemy, and that your forces must be on the *battle-field* where the fate of the nation is decided, and not guarding the bazaars of Durban, Cairo, and Lucknow.

Last of all I come to the most important force of all, because it is the only force capable of supplying the number of cavalry we want, if we make serious war; that is the Yeomanry. I think it is worth our while to consider whether the Yeomanry system as it exists is adequate to the great responsibilities which in point of fact rest on it. Is the training of its rank and file what it should be, given not the opportunities that the men have, but given the enormous responsibility that rests on them? Have the leaders sufficient technical skill, and sufficient power to teach? Because you must remember that the shorter time you have men the better the instructors must be if they are to learn in the shorter time the same amount that their enemy learns in a greater time. Is their equipment all that it should be? Is it wise that the Yeomanry regiments should not even be accustomed to handle the lance and sword? Then last of all comes the most important question of all, and that is the question of chiefs. The Yeomanry are never collected in large units, brigades, and divisions, and, consequently, it is practically impossible to judge by the test of manœuvre if the leaders among the Yeomanry officers have the necessary skill to handle masses of troops. That there are distinguished cavalry leaders among the Yeomanry officers no one doubts, but in order to reap the benefit of their existence you must know who they are in peace in order to be able to give them commands in war; and the only way you can do that is by giving them the

chance of handling their troops at manœuvres under critical judges, so that they may be chosen to command in war.

It has been said that great strategists are far more plentiful than cavalry leaders. It is quite certain that although great strategists are none too plentiful, still history has recorded more great strategists than it has great cavalry leaders. You can count on the fingers of one hand the men who have risen to great positions as cavalry leaders in modern history.

Proceeding from the soldier to his horse, the next question is the horse supply of the British nation. The President of the Board of Agriculture of the present Government has repeatedly warned us of the risks we continue to run by neglecting our horse supply. I believe it is not so much the public as his colleagues that he must convince of this danger. The enormous cost of the Remount Department in the comparatively small Boer War, small in comparison with a war against one of the great Powers of Europe, or with the United States, should furnish him with a very powerful argument. We are certainly no better organised in this respect than we were in 1899, and the state of things must be admitted to be extremely dangerous. Our best horses and our best mares are going out of the country, and Ireland, which is the natural breeding ground of our horse supply, is being denuded of its best stock. Sir Edward Locke Elliot, who reorganised the horse supply of India for Lord Kitchener, has stated that eight years' energetic work is required to make any appreciable difference in our horse supply, and as every year we put it off adds one to those eight, it cannot be insisted on too strongly that we should begin at once. A gentleman, who is very much interested in this subject, Mr. Algernon Turner, the Chairman of the Brood Mare Society, and a Member of the Council of the Hunters' Improvement Society, intended to have attended the lecture to-day, but he was unavoidably prevented from attending. He has sent the following letter:—"12th November, 1907. Sir,—A cavalry soldier without a horse is not of very much use, and the question how to mount him in time of pressure is serious. So much has been said on the subject of horse breeding in recent years, and the question has been brought to such a point in Parliament, that it is unnecessary to dwell on this matter. The real question is, what steps ought the Government to take now, if it intends to act. The outline of a plan has been placed before them, supported by the most expert authority in the kingdom. The entire question is one of organisation, and time is an important element in the case. What is needed is for the Treasury to sanction an expenditure, between now and 31st March next, not exceeding £5,000, by the Board of Agriculture. Let the President appoint a provisional organising committee to organise one or two suitable districts, making the brood mare the unit, in accordance with paragraph 13 of the memorandum on horse breeding submitted to the President of the Board of Agriculture, as the outcome of the Conference of 13th October, 1906, reprinted in the Report of the Brood Mare Society of this year. The advantage of this plan is obvious. First, it saves precious time. Secondly, by appointing a provisional committee to expire on the 31st March it enables the Minister to test his men. Thirdly, it provides an opportunity to gain much-needed experience. Fourthly, it in no way interferes with any existing authorities or commissions, for it breaks

new ground. And lastly, it does not commit the Government to any very rash departure. The Organising Committee would, of course, be responsible to the President of the Board of Agriculture, who would account for the funds."

The point I have left to the last, but which assuredly is not the least important, is that of the moral of the soldier, what old-fashioned writers have called the *ardour* with which the soldier enters on a campaign, and how he does his work. I would not venture to assert that to be a brave horse soldier is more meritorious than to be a brave foot soldier, because I know well that the very reverse is the case. The crushing fatigue of marches in the dust, the heat and the cold, with the weight of the rifle and the kit on a man's back, often crush the physical strength entirely out of the infantry soldier. The cavalry soldier is exposed to no such demoralising influences, and he reaches the battle-field at any rate with physical strength to do his best. Not only that, but I think the companionship with his horse, the discipline of learning to ride, and the healthful exercise of riding, tends to increase a man's confidence and his moral qualities. The horse soldier should never forget that the word *chivalrous*, which was held in honour by all who called themselves Christians, was applied peculiarly to the cavalry soldier; and I cling to the belief that those qualities still count for a very great deal, both in peace and war; I believe that the victories of the Japanese, and their success in peace time as well, are a standing proof of that fact.

After the fall of Napoleon, in 1815, there came a period when all war and everything pertaining to it was unduly decried. It was a natural revulsion from the bloodshed and useless fighting which had taken place all over Europe for twenty years, but there is very little doubt that this feeling was carried too far, and the reign of industrial civilisation in England was carried too near its logical conclusion. Anyone who has been through the manufacturing districts of England, the great cities of Lancashire and of the West Riding of Yorkshire, and even the slums which adjoin the rich thoroughfares of London, must be aware that peace has its losses, its disasters, no less than its victories; and that the drinking shops, poverty-stricken inhabitants and disgraceful slums of our industrial civilisation, when war was most remote, leave the fact beyond question that the moral qualities of the soldier are not to be despised, and that war is by no means the worst curse that can happen to a nation. Remembering how difficult it is in peace to preserve an army from the rust of inefficiency and corruption, how difficult it is to ensure that the best men lead it, and that the spirit of modesty and courage is maintained in the ranks when there is no immediate prospect of war; remembering, too, how much of national life and national character is reflected in an army, particularly in the stress of battle on which the fate of a nation depends—such battles as we have quoted, Gravelotte and Mukden; remembering all these things, we must admit it may not, after all, be so foolish that the nations which prevail in war should be those most fitted to prevail in peace, and to surpass their competitors in the struggle for racial supremacy.

The CHAIRMAN (The Right Hon. Sir Charles Dilke, Bart., M.P.):—At the close of our discussion I shall ask your leave to propose a vote of thanks

to Captain Battine for the admirable lecture he has just now delivered. Some years ago, those of us who were forced, as politicians, to find money for the Army, and enquirers, like Mr. Spenser Wilkinson, and others, who were trying to find out the principles on which the British Army should be reorganised, had great difficulty in discovering any British body of doctrine with regard to cavalry. Even two or three years ago there were marked contradictions in this very room between different schools of thought in the British Army about cavalry. We, of course, were apt to magnify the importance (in their bearing on future wars) of our particular difficulties in the South African War—nations always are—and the result was the existence of various schools of conflicting doctrine. That is happily at an end. I congratulate our Secretary on having, through the editorship of his most valuable *Cavalry Journal* done something to contribute towards bringing about a more uniform doctrine in this country, or a reversion to the good doctrine of times past—a reversion from our own eccentric doctrine to the general cavalry doctrine of the other armies. It is no longer necessary for us to quote from foreign writers, because we have the most excellent precepts now laid down by authority for ourselves. The difficulty is to see how far these precepts have been carried out, and been acted on in practice. In the new "Cavalry Training," the official book issued by command of the Army Council from the War Office and in the name of the General Staff, for the guidance of all concerned, we find the principles laid down which two or three years ago were questioned here, and which Captain Battine has reiterated here to-day. For instance, we find on page 185 that "The value of cavalry is greater now than at any previous period." That is now the accepted official doctrine here. Then, on page 186, it says, "The extended order in which infantry now fight, the severe nervous strain to which they are subjected, and the exhaustion entailed by the duration of modern battles, make them peculiarly susceptible to sudden and unforeseen attacks of mounted men." That is Captain Battine's doctrine, and, I think, a sound doctrine. That is the explanation of the increased value of cavalry in war—the explanation, for example, with regard to every battle now leading to a state of exhaustion, as we saw in Manchuria, something like that of a retreat from Moscow; a state of absolute nervous despondency and depression; exhaustion from want of sleep and food; from continuous fighting and strain. In addition to that there is a point which is mentioned in Captain Battine's lecture, the failure of ammunition for repeating rifles and for Q.F. guns; not only in the case of infantry, to which Captain Battine alluded, but still more in the case of artillery. The Q.F. guns and repeating rifles of the present day require a supply of ammunition that is fabulously great. The difficulty of getting the ammunition on to the field, and the difficulty of communications, have enormously increased. There have been, in all recent battles, occasions when the ammunition, either for the infantry, or the artillery, or for both, has failed. Then, of course, more than ever, the troops are at the mercy of surprise. There is another novelty which increases the usefulness of well-handled cavalry in war. It is probable that there will be a considerable use in future wars of half-trained mounted infantry of various descriptions; but such mounted infantry, although it may be useful in certain cases, will be the prey of cavalry, if the cavalry is properly led. That is, I think, the judgment of all who have thought out recent wars. It is an opinion in which the highly-trained professional soldiers of France and Germany concur with General Delarey and the other Boer generals representing a wholly different element: from it there is little dissent,

except that which was manifest in this country some three or four years ago I should like to quote, as we have had a German cavalry leader—the Emperor—passing this door to-day, what a French general, General Langlois, who is a scientific gunner, and not a cavalry officer, has written on the subject. General Langlois has defended the German Emperor's view of cavalry—the ordinary Continental view of cavalry—against the few French critics. These are General Langlois's words: "Far from joining in the criticism of the action of the mass of cavalry led by the Emperor in their manœuvres I see in it, on the contrary, a just and long-studied conception of war." The latest Japanese experience (and the Japanese were a people starting fresh, as it were, in modern war) is the same, and confirms what Captain Battine has said here to-day. The moral he has drawn from his study of the Manchurian campaign, not only in case of cavalry, but even in the case of infantry, is that it is the lance, the sword, the bayonet—it is steel—which is the ultimate decider of victory. A most remarkable book has come out within the last few days, probably the most vivid book on actual fighting, not from the great soldier's, but from the small soldier's point of view, which has ever been written; a book called "Human Bullets," by a Japanese ensign, Tadayoshi Sakurai. The writer of that book says that the Japanese answer, when asked, "What is the power to follow up advantage to its sure result, final victory?" is, "The bayonet and the war cry." By "war cry" he means that yell, that Banzai, to which Captain Battine was just now alluding. In modern war we have really reverted to an almost primitive position. Downright exhaustion, nervous depression, becomes such that, rightly led at the right moment a small force of cavalry however armed, will "go through" an army. We have been told, and it is confirmed by the official book, that everything depends on leading. Captain Battine has quoted Napoleon, and has also referred to Murat. Napoleon thought so much of the importance of his cavalry leader that he took Murat when King of Naples, with him to command the cavalry of the Grand Army, knowing perfectly well at the time that Murat was engaged in treacherous correspondence with his enemy. The value of having Murat's name and Murat's "eye," and the feeling that when the professional soldier got there he would forget politics and do his duty to the army, made Napoleon consider that an essential point in the composition of the Grand Army. This is all admitted; it is the official doctrine here at the present time. The new book says, on page 188, in dealing with the question of the command and leading of cavalry: "The personality of the commander is the most important factor in success. The resolute offensive which is the essence of cavalry action, and the rapidity of movement, which is the characteristic of the arm, allow only the shortest amount of time for consideration. Rapid decisions may, therefore, have to be made under the most unfavourable conditions," and so forth. Nothing can be stronger than those words; and we are told that, both in officers and men, this needs long training. There are five pages here putting forward all the points on which cavalry, to be useful, must be trained. The advantage that we possess is great, as Captain Battine has said, in the long service of our cavalry because what we call short service here is, of course, inconceivably long service from the point of view of all the Continental Powers. The book says that "only the most strenuous training of the force, combined with high executive talent in the leaders down to the most junior, can compensate for all these difficulties. A high standard of training, not only in collective action, but also in detached duties, is essential to efficiency for war." There is a very important admission, if I may use that word, in

the book and it bears upon the supplementary, or second-line, cavalry. It is here written, "A body of cavalry is only capable of executing in war what it has practised in peace." That, I think, is a phrase upon which we ought to fix our minds. It is admitted by French and German writers—General Langlois, for instance, in France, and General von Pelet-Narbonne, in Germany, and by many most distinguished cavalry leaders, that they are unable to train their cavalry to dismounted action; they have not time enough to do it in. The Germans have three years for cavalry. The French have two years only, although they have a great desire to re-engage men for the cavalry, as they re-engage men for their Navy. Up to the present time they have not met with any great success: the number of cavalry re-engagements in France last year was the highest ever known, and it reached, I think, a thousand; so that their privates are nearly all two-year men. They say that they cannot teach them dismounted action, and they fall back upon a substitute, which has not been mentioned in this country, but which is important. It has not attracted much attention outside France. The French intend in future, being unable to teach their cavalry dismounted action, to employ with cavalry light infantry—infantry of a very light description. This is provided by specially-trained battalions of the chasseurs, composed, as is the cavalry, of the active-service men, with only one year of the reserve. As in the cavalry so in the French chasseurs now, who are to be attached to cavalry in war, as they are already in the frontier manœuvres; they do not call out in those battalions the reservists they would call out in the ordinary infantry of the line, but only the first year reserve men. The other chasseur reservists are passed on to the ordinary infantry, as being no longer able to "go the pace" that these light infantry attain who march with cavalry. In this country we have had definite and important proposals for another form of mounted service. The men in our cavalry have great length of service; many of them have been serving for over seven years, and almost all have served three, four, five, six, or seven years, as may be seen if you will look at the tables of ages of the cavalry. Therefore, although the French and Germans cannot teach dismounted action, we have time enough to do it. Nevertheless, it has also always been intended to use mounted infantry in our Army. It would probably be going too wide to-day, when we have so many tempting subjects to discuss, to refer to the composition of mounted infantry; but it was the intention and belief both of the Elgin Commission and of the Esher Committee, that regular mounted infantry, that is to say, cavalry intended for dismounted action, should be created here, and that we should give up the system of picking men from infantry battalions, teaching them a certain amount of riding, and then sending them back again to their battalions. Of course, that has not been done. The whole question of dismounted action for regular cavalry is one as to which, being a civilian, I have not much right to an opinion, but one as to which I have some doubts. There was important evidence given by Sir John French and also by General Haig, before the Elgin Commission, on this point; and I would like to quote to you General Haig's actual words—he was Colonel Haig then—from the second volume of the evidence given before the War Commission, page 430. He said: "Except in very exceptional cases"—which he specified—"the leader who gets down and begins firing, is lost." As an outsider, I think there is a great deal of truth in that, and I should feel more easy if cavalrymen would convert me on that point. On page 187 of "Cavalry Training," some confirmation is given to that view expressed by General Haig. It says: "The average leader"—that is the average cavalry leader in this country—"is only too

ready to resort to dismounted action, which often results in acting defensively. It is of importance to lay stress during peace training on the necessity for *offensive* tactics for cavalry, even when fighting on foot. It must be accepted as a principle that the rifle, effective as it is, cannot replace the effect produced by the speed of the horse, the magnetism of the charge, and the terror of cold steel"; and so forth. That I think, is the sounder view, and it is outside this country a universal view. What about numbers? Our cavalry, of course, is a costly arm. Cavalry—inclined to rely on the cavalry spirit, and the connections of cavalry in "society"—cannot justify their existence and their cost, unless they can persuade the electorate, the democracy, that cavalry is necessary, as I think it is necessary, speaking as a civilian and an outsider. That is the task. At the present moment the Army is dear. The nominal force is large but the actual result for war is small. Captain Battine has already alluded to the question of numbers. We have a large number of cavalry "regiments," but we have no means of swelling them in time of war; and the regiments, being very small in the number of horsed-men they can put in the field, are of course, costly for what they produce. Captain Battine spoke about being able to send out ten thousand cavalry from the home army, and he said they could be horsed. Of course, anything can be done if you spend enough money and have enough time; but we are told that we possess a very large expeditionary force ready for immediate despatch abroad, and that this justifies our very large expenditure. Can we send ten thousand men, horsed, abroad from the home army? I fear we cannot. I fear Captain Battine has also diminished the number of regular cavalry which other Powers can put into the field. I am always inclined to look at the number of our cavalry horses and at the age of the horses that we possess, if I am allowed to do so. I say "if I am allowed to do so," because we knew up to this year; but this year the information is concealed, and it is to be concealed for the future. If you look at the General Annual Report on the British Army, you will find we possess at home, that is to say, not on the home station, not on the British Establishment, but actually in the United Kingdom 6,781 cavalry horses of all ages; plus household cavalry 796, that is to say we have 7,500 cavalry horses of all ages. That is an insufficient supply as compared to what we pay for and the number of men that we keep in costly cavalry regiments; and it does not point to being able to send out with the expeditionary force a cavalry force of ten thousand men, properly horsed. I cannot see where that cavalry force comes from. If you count South Africa which is a long way off, and if you count Egypt, there are another two and a half thousand horses, and the total number, without the Household Cavalry, is a little over nine thousand horses of all ages, and with the Household Cavalry about ten thousand horses of all ages. The Germans and the French only count the cavalry horses that they would send to war, and they do not believe in sending to war five-year-olds. The Germans are doubtful even about six-year-old horses for war. It is seven-year-old horses that they intend to send to war; the Germans do not take six-year-old horses into their computation if they can help it. Up to this year we knew the ages of the British horses, and a great number of the horses were not of military age. Of the 7,500 cavalry horses at home a great proportion are not of military age. This year some of us have mentioned this fact in the House of Commons; and now this note appears: "The ages of public horses have been omitted." Of course, we should have found it out for ourselves if we had not been told, but there it is—officially. I said I thought that Captain Battine had understated the number of the cavalry of other

Powers. The Germans are increasing their cavalry every year. The increase was voted some years ago, and it is being gradually made. He said that the German cavalry were more numerous than the French, and that is believed to be the case. We know the numbers of the French cavalry. The French can put into the field 67,000 cavalrymen and 70,000 cavalry horses; that is to say they have a horse for every man and they have 3,000 horses to spare, and we are certainly not at all in that position. We have few cavalrymen—owing to the weakness of the regiments—for the money we spend on them; but we have still fewer horses of military age; and in our Expeditionary Force, as far as I can make out, unless we spent money as we did in the South African War, and had a long time to prepare, half our long service cavalry in this "immediately despatched" Expeditionary Force would have to go on foot. It has been said that we take our best infantry and put them on horseback; and in a similar way it may be said that half our costly and well-trained cavalry are intended to go on foot; there are no horses for them. The French do not use their horse-conscription for cavalry, any more than we are able to use our omnibus horses for cavalry. The French cavalry would go to war on the first day on which war was declared, as they stand, that is to say, without a single horse brought in by the cavalry conscription. These horses would come in for cavalry of the second line, and for filling up gaps. The War Office has just issued, and this Institution has just published in the JOURNAL, in two parts, a long document called "The Military System of the Future of the British Army." In that there is a very fierce and a perfectly sound attack upon our old plan of preparing cavalry for war; and it is pointed out at length how it broke down in the case of the Boer War. I want to know whether things are better, whether we have met up to the present time the difficulties that are there pointed out. I hope that Colonel Leetham, in his *Cavalry Journal*, will give us some information if he can from time to time about the depôt system for cavalry—about what is replacing the proposals on that subject of Mr. Arnold Forster, which were not carried out. In that official document we are told that the four existing cavalry brigades are "untouched"; they are to be left alone. These four brigades, Captain Battine says, can be grouped for war; and it is stated in that document that for war they are to be grouped into one cavalry division—non-existent in time of peace. So far as I know its staff is non-existent, and cavalry-generals not trained in the use of men as a cavalry division, and there are no divisional manœuvres, so far as I know, for that cavalry which is to be sent abroad "immediately" in time of war. In the French Army there are eight standing cavalry divisions, and about four of those generally take part in the grand manœuvres every year, two in one part of the country, and one in each of two other parts of France. I myself have seen two cavalry divisions taking part in the same manœuvres in France in time of peace, exactly as they would go to war—in strength of men and horses. In future, as I understand, there are to be three kinds of cavalry recognised by the British Army; that is the modern German theory. It is not yet, I think, fully adopted in France; if it is, the matter has been kept secret. It is known in Germany, as we see from our own official book, that here we are to have three kinds of cavalry—the independent, or strategic, cavalry, the protective cavalry, or army cavalry, as the French call it, and the divisional cavalry. As regards the strategical independent cavalry, everything depends upon the chief command of the army. It is under the Commander-in-Chief, and it is his business to make the best use of it he can. There was at one time in France and Germany, a feeling that in the strategical or independent cavalry the divisions will always

be in the place where they are not wanted: "*Indépendante et nutile.*" Captain Battine spoke of the failure of the cavalry to appear at the battle of Gettysburg, on which stress has been laid in his book, and also in other books. It so happens that serving for a time under the Prussian Knights of St. John, I came into Pont-à-Mousson at the moment when the Germans were greatly excited on this matter in August, 1870. Captain Battine did say that the Germans did not, in 1870, make all the use of their cavalry that they might have made, and I entirely agreed with him, as a civilian who heard that matter discussed at the time. There was what was called "the failure of the cavalry division," under, if I remember rightly, General von Rheinbaben, in the fighting on the west of Metz. The difficulty is this: There are three points of view. There is the point of view of the Commander-in-Chief of the whole army; there is the point of view of the cavalry general commanding the cavalry; and there is the point of view of the infantry and artillery divisions that are engaged, or the army corps who are engaged, and who want "protection." The doctrine now seems to be to divide your cavalry distinctly into three. The same matter was discussed some years afterwards in France, in consequence of the failure of the French cavalry divisions in the great manœuvres of 1891, when 127,000 troops were commanded by General de Galliffet against a skeleton enemy. He had two cavalry divisions and he was known to have thought that the cavalry had conspicuously failed. That was a great controversy We are now to have this cavalry screen or this cavalry to act on communications; that is to be the main duty of our regular cavalry division. Then there is to be the "protective" cavalry, or the army cavalry, what we call here now protection cavalry—what General Haig, like the French and Germans, calls army cavalry. It has been said that an army corps, or a group of divisions without that cavalry is like a blind man without a dog. They do not know where they are going. With regard to their second cavalry, our book says that "brigades are to be formed for war"; the existing brigades are, as we say, to be grouped into a division. Brigades of regular cavalry are to be formed for protective cavalry. Then comes No. 3, which is called "divisional cavalry." That divisional cavalry has been left *in nubibus* after certain announcements had been made with regard to it. The book at page 185 states distinctly that we are to have all three kinds, and explains why we are not safe without them; and at pages 192-193 the duties of the three kinds of cavalry are clearly explained in the German fashion. The divisional cavalry were to be raised, not strictly from the yeomanry, because the men drawn from the yeomanry were to go to fill up the divisional gaps—the losses of war; but they were to be formed outside the yeomanry regiments, though more or less in connection with the territorial army. They were to be enlisted for army service, passed into the reserve and drilled, not necessarily with the yeomanry regiment to which they nominally belonged, but probably somewhere else. That is all left in the sky; and so far as I can learn, no steps have been taken towards meeting that difficulty; and it is a very hard point to meet. Under the pressure at the moment it will be difficult to keep the three kinds of cavalry apart. If there is some great object in connection with which cavalry ought to be utilised, the Commander-in-Chief will force into his cavalry anything he can get in the nature of cavalry. It is pretty certain, I should imagine, that that will happen. If the divisional cavalry are such bad cavalry that they cannot be employed as cavalry at all, I think they will be left to the division; but if they are good, I think they will be swept off into one of the other two kinds. The whole distinction appears to me to be a little fine and a little difficult to observe in war, but there it is—it is official. We

have the right to ask what steps are being taken to fill up the three classes, which we are told are essential to the efficiency of the Expeditionary Force.

Colonel G. H. Elliot (late 3rd Bengal Cavalry) :—There is only *one* great original or fundamental law of cavalry, as true and as complete as any civil law or doctrine on any given subject or thesis, and it will be found in the Classical "Hipparchicus," or "The Duties of a Commander of Cavalry," by Xenophon. (See English translation by Bohn — "The Minor Works of Xenophon.") It reads thus : "An army without cavalry profits nothing by its victories, and loses all when defeated." In 1907 we have seen for ourselves in Manchuria the Japanese fail to profit by their victories time after time, simply because they were weak in cavalry and also horse artillery. The Japanese General Staff in 1907 acknowledged this fact themselves, and are now taking the necessary steps for a stronger force of cavalry. Napoleon acknowleged the truth of the above cited law on cavalry first laid down by Xenophon. (See Baron de Azemar, "Avenir de la cavalerie, Examen technique des ouvrages publiés sur l'ordonnance du 6th Decémbre, 1829. Tactique des trois armes dans l'esprit de la nouvelle guerre." Paris, 1860.) The Author quotes a maxim of Napoleon : "If I had had cavalry in 1813 I would have re-conquered Europe." Here we must recollect that Napoleon had all his cavalry destroyed in 1812 in Russia. He never, as he said himself, recovered from that blow. Moscow was a fatal complete disaster, for it deprived him of his cavalry, and hence he was unable in 1813 to profit by his victories over the Allies; and at Leipsic it was the failure of Murat to repeat his former successful cavalry charges that. practically speaking, compelled Napoleon to retreat. Otherwise General Sir Robert Wilson, the English Commissioner with the Allies, himself said, as regards Leipsic, "They could not carry a single one of the villages which the French proposed to hold as vital to their position." It was the direct failure of the French cavalry charges at Liebertvolkwitz. under Murat, that in reality broke the French line of defence in and around Leipsic. In 1870, at Mars-la-Tour, 96 officers of the German cavalry were lost, *i.e.*, killed, wounded, and missing (1,425 men and 1,837 horses). But this sacrifice was justified by the facts of the case—the cavalry gave what was asked of them, and that was "precious time" for the arrival of more German troops in the fighting line. Finally, at Waterloo in 1815, it was the army of Blücher and his Prussian cavalry that took up the pursuit of the French, kept the bayonet to their ribs, so to speak, and never allowed them time to reform, until they had been driven under the walls of Paris. On this head the supreme authority is no less a personage than the famous General Müffling, founder of the German General Staff, in 1822. He was Prussian Commissioner on the Staff of Wellington at Waterloo. (See his "Memoirs," translated into English by Colonel Yorke in 1853, entitled "Passages from my Life, with Memoirs of the Campaign of 1813-14.") Finally, the old law of the British Army was "Horse, Foot, and Dragoons." It is the co-operation of the three arms in war that achieves victory—*the attempt to separate units of war in war* can only end in disaster sure and certain. There is no campaign in which greater error has been taught, or more fallacious views on the leading of cavalry expressed, than will be found as regards the gigantic struggle in the American Civil War. Briefly, so far as the Northern forces are concerned it was not until 1864, when Sheridan *first massed his cavalry*, that the fruits of victory were duly secured. In 1862 and 1863 the American cavalry (Federal), practically speaking, was employed only as mounted infantry, and that in separate small detachments, too often without

cohesion and without due design. Sheridan, however, taught by experience, became the worthy rival of one of the greatest cavalry leaders that has ever lived, another Cromwell, Ziethen, or Seydlitz—that is, the famous General J. E. B. Stuart, Commander of the Cavalry in Northern Virginia. This latter, mortally wounded in the Wilderness campaign, while engaged in fighting Sheridan, who then commanded no less than 12,000 horse soldiers, with an equally large force of artillery, is an example for all time of the perfect cavalry leader. The mounted charges he delivered, as at Brandy Station (or Fleetwood), are models alike of manœuvre power and skilful leading. On the other hand, he could use his cavalry dismounted, as did Marlborough the Scots Greys at the Schellenberg, on the Danube. We cannot be too careful in our dates of this American Civil War, for the facts are briefly thus: In the winter of 1863-64 the Northern Cavalry, under Sheridan, had vastly improved, while on the other hand, that of the Confederates became weak in numbers and badly equipped. Sheridan, in the Wilderness Campaign, moved with 12,000 horse in rear of the army of Lee, and threatened Richmond—and when Stuart died the Confederate Cavalry died with him. Sir Charles Dilke has mentioned the authority of General Langlois. He is not an infantry or a cavalry officer, but an artillery officer.

The CHAIRMAN:—I did not call him an infantry officer.

Colonel ELLIOT:—But his opinion is most impartial, because he is not a cavalry officer. He is an artillery officer, and I know he has given very valuable evidence with regard to the use of massed cavalry. With regard to the point which has been raised about the division of cavalry into three sections, the original proposer was another French officer of the name of Lewal. (See his "Tactique des renseignements," 1881.) But he only divided it into two. It is doubtful whether Von Hoenig has not taken up exactly the same line. At any rate, they both lay down that the cavalry that protects an army must be absolutely separate from the army cavalry. We seem to have made a rather fine distinction by dividing the cavalry into three, but the original proposal was only to divide them into two. The cavalry of information and security. The American Wagner follows the same line of thought. (See his Treatise, "The Service of Security and information." Third edition. 1896.) It is not until 1907 that the real truth has been brought to light as regards the cavalry of the American Civil War, though long known to experts on the subject. In the "Journal of the United States Cavalry Association," October, 1907, a most remarkable article has appeared: "The Second Cavalry Division, Army of the Potomac, in the Gettysburg Campaign," by Major-General D. Mc M. Gregg. from which it appears that in preparing for war in April, 1861, "the Lieutenant-General commanding the armies of the United States, not only discouraged, but, indeed, was firmly opposed to having a proper proportion of cavalry in the force about to be raised for the national defence." Every earnest student of war, as it should not be made, should carefully study the article quoted above, more especially as the author, General Gregg, does not write from mere theory, &c. He actually commanded the Second Cavalry Division, Army of the Potomac. Finally, there is only *one* Law of War—cited by Napier in his Peninsular War, Vol. VI., thus describing Napoleon's system of war, he writes: "But he also taught them to combine *all arms* together, and to keep strong reserves, that sudden disorders might be repaired and the discouraged troops have time to rally and recover their pristine spirit."

Mr. SPENSER WILKINSON :—I do not know that I can make any criticism on what I have heard this afternoon, because I have seldom had the pleasure of listening to an address in which I have been able to agree so much as with Captain Battine's lecture. There is, however, one point on which perhaps I might be allowed to say a word, as an observer—because, of course, I am not a cavalry officer and have had no practical knowledge. The cavalry question appears to take the form of two large questions; the first, addressed to a statesman, and taking the shape of how much cavalry we shall keep in a given army; and the other, the question for the cavalry officer, namely, how shall I train my cavalry? I take it there can be no doubt that the basis of all cavalry training must be to make your men accomplished horsemen. I myself have never been able to believe in any kind of mounted arm in which a man has not become a thorough horseman. If it were merely from the point of view of acquiring that horsemanship, of which the result is complete self-confidence in the man, in himself and his horse, and the other men who are riding with him, I think for that purpose, quite apart from tactical questions, any body that is to be generally trained as cavalry should have a training brought up to the point when they can charge home, when they can ride to the charge with confidence as a body, because I suppose that is perhaps the best test of military horsemanship, which I believe to be the foundation of all cavalry work. The other point concerns the question of cavalry dismounted action. I take it that the fact that all cavalry are armed with a fire-arm, proves beyond doubt that it is not only necessary, but that they must be able to use it; and I think the ideal of one part of the cavalry training, which must be always subordinate to the main thing, the horsemanship, the man being a horse soldier. I think if the man has a fire-arm he ought to use it in his instruction in the same way that you ought to make the infantry use a fire-arm. That may be put in this way: There are two objects in teaching a man to shoot. One is that he may be able to hit the enemy, but the other, which is equally important, is that he should have full confidence in himself as a user of his weapon. The trouble with half-trained infantry is not so much that they cannot shoot, but that they have a profound conviction that they will not hit anything; and the moment a man goes into action with such a conviction it will not take long before he is frightened and goes away. But if you train a man so that he hits something, not at a mile range, but so that he knows that with a reasonable target he has a reasonable chance of hitting, you have given him a moral force which you cannot give him in any other way. I believe you ought to aim with your cavalry at giving them that sort of training with the rifle. You do not want to make great marksmen of them, but I think, when you have given a cavalryman a rifle you ought so to train him that he knows he can do something with it, that he can hit something with it, and has some confidence in it. For my own part I find it very difficult to believe that is an impossible thing with the cavalry soldier. After all, what is the amount of training that an infantryman gets at rifle shooting? Two or three years ago—I have not seen the figures lately—he fired perhaps two hundred rounds in a year, and that was thought to give a very sufficient result. You have these expensive cavalrymen for several years, and it seems to me that you ought to be able to find time to let them do some shooting. If I had infantry to train my ideal would be that I should like to make a man fire ten shots every day for, at any rate, six days a week; and I think if you made them do that practice you might say that at the end of a year or two they would be as good shots as you would desire: certainly better than the

men in most armies. It does not seem to me difficult, as regards cavalrymen's time, to make it possible for them on a certain number of days in the year, or during a certain number of weeks in the year, to fire off ten shots a day. The difficulty might be in finding the ranges, and that appears to me to be one of the principal weaknesses of our military administration. They give us great schemes of organisation, which last for several years, on paper. Sometimes little is done, sometimes the paper is torn up and a new paper substituted. But if we get an army at all, the army must shoot, and, therefore, any Minister of War who will buy sufficient ranges at which we can train all the men to shoot, will do more than any Ministers who make great schemes, which are partially, or fragmentarily carried out. If you had the ranges you would be able to make the cavalrymen good shots; you would give them that confidence in themselves as riflemen, which too often they have not possessed in the past. I also believe that if you have taught your cavalrymen to shoot with his rifle, and to know something about some part of infantry work, to have that knowledge of operations of war which a man gets who proposes to fight with a rifle, that will not make him afraid of his horse. On the contrary, when he knows how difficult it is for the infantryman to hit the mounted man, when he is a mounted man his confidence will be all the greater.

The CHAIRMAN (The Right Hon. Sir C. Dilke, Bart.):—I think we are very grateful to Mr. Spenser Wilkinson for dealing with one portion of the subject so admirably as he has done. I only wish he had extended his remarks to a field, in which I know he is not only competent, but competent in a degree which cavalry officers would fully recognise in a civilian, or one who has had experience only of a very different kind. But as no one desires to continue the discussion, perhaps I may say that one reason why I think that has been the case is, that we cannot get any "forwarder" at present. We have got our principles admitted, as I tried to show; they are agreed to, no one says the contrary of what Captain Battine has told us here to-day. But, on the other hand, when we ask what is being done to carry out those principles, we are told that we must be "patient"; we have not yet got material to go upon, and we do not know what steps are being taken for increasing the possibility of our present supply of cavalry being able to hold the field in war. The depôt system, the supply of drafts, the supply of the additional cavalry to be provided for in the new way, and, above all, the supply of an increased number of horses ready to take the field, are unsolved problems. On that last point of horses, I think it was Captain Battine's hope that we should have had a special discussion here to-day. I saw Colonel Seeley this morning, and he would have been here this afternoon to take part in the discussion but for the fact that he received a sudden message to go down to his yeomanry regiment; and you know the circumstances which have kept away Mr. Algernon Turner, who was to have spoken on that part of the subject. I hope that that side of the subject will be followed up here soon, because there is no doubt the time has come when, at all events, that particular matter is ready for treatment, and when definite proposals ought to be put forward with a view to the improvement of the remount system as far as regular cavalry is concerned.

Captain BATTINE, in reply, said:—There are only two points which have been raised in the discussion, to which I should like to allude. One is the question of the amount of cavalry which we could despatch abroad as a

mass. I put 10,000 horse soldiers as the force of cavalry which we might mobilise if we took every one of our ninety squadrons. That figure included South Africa, Egypt, and India, and, of course, the regiments in India would have to be replaced by other formations. Unless there was immediate risk of war in India or an Indian outbreak, there is no reason why these Indian regiments should not be taken.

The CHAIRMAN (Sir Charles Dilke) :—I was dealing with what we call the expeditionary force, and that is supposed not to touch India. We have not got the cavalry for that.

Captain BATTINE :—With regard to the French cavalry, I know that the establishment is greater than 30,000, but I put 30,000 as the force which can be made up by the cavalry divisions, which are the strategic cavalry. They have a very large army cavalry besides, and there is very little doubt when the pinch comes that the army cavalry will be taken for the more important work, both in the French Army and others. The other point is Mr. Spenser Wilkinson's, with regard to the training of the horse soldier. I need hardly say I more than agree with him; he put, far better than I could, exactly what I think about the training of the cavalry soldier. The horse is his principal weapon, and when he is once at home in the saddle, and can charge home, the rest will come very easy, including the elements of skirmishing and the use of the rifle. I think what is not appreciated by people, who have not served in cavalry regiments, is the skill which cavalry soldiers actually have with the rifle. Not only have their picked shots very frequently defeated the picked shots of the infantry regiments, but the average shooting performance of a line squadron compares very favourably with the shooting performance of companies of well-trained infantry, both our infantry and Continental infantry. I do not attach so much importance to that, because shooting at a range of known distances, with every luxury and comfort, with lemonade at your elbow, and shooting in battle at unknown ranges, with other people shooting at you, and all the circumstances against you, is quite another thing. But I think from what I have seen, and from my experience of service in the cavalry, that the fire of the squadron is more to be dreaded at a thousand yards on a hillside, than the fire of most infantry companies. I may be wrong about it, but I should like to hear the opinion of generals who have inspected and commanded both cavalry and infantry. Those are the only two serious points which have been raised in the discussion, which has lasted quite a long time. I thank the audience very cordially for the kind and patient way in which they have listened to my lecture, because it is so much easier for an inexperienced lecturer to address a sympathetic audience.

NOTES UPON COMPANY AND BATTALION TACTICS AND THE EMPLOYMENT OF ARTILLERY IN BATTLE.

BASED ON THE EXPERIENCES OF THE RUSSO-JAPANESE WAR OF 1904-5.

By Captain A. DEGTYAREV.

Translated from the *Voïennyi Sbórnik.*

Communicated by the General Staff.

Continued from February JOURNAL, p. 235, and Concluded

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10. ARTILLERY IN THE ATTACK AND DEFENCE BY DAY.

APART from any ultimate objective of its own, the artillery in a battle can very materially contribute towards the general success of its side. In the attack the principal aim of the artillery should be to force on a duel with the hostile artillery, in order that the latter may thus disclose its dispositions. The artillery duel, however, in the accepted sense of the word, is now a thing of the past. The facility with which indirect fire can be employed from concealed positions renders the modern gun invulnerable, and it is useless to attempt its destruction. The artillery is better employed against living targets, but it cannot seriously damage entrenchments or concealed targets—a task for which the old types of shells were more suitable.

Living targets expose themselves nowadays for a very short time only, but the artillery, by making good use of its quick-firing capabilities, should be able to make them suffer. For this reason rapid shrapnel fire is most commonly used. The same quick-firing powers of the modern gun oblige artillery to make all its preparations and to come into action out of view of the enemy. To be the first to open fire is a great step towards success, more particularly when firing from a concealed position. If the enemy, notwithstanding this, succeeds in locating the battery, and there is danger of heavy loss to *personnel*, it is better to wait. In this case the enemy will soon change to slow fire, when the battery should again open with rapid fire for a short time. If the shells burst accurately the opponents will probably cease fire. It was in this manner that the 3rd Battery of the 5th East Siberian Artillery Brigade engaged 18 guns, firing from three directions, for four days (27th February to 2nd March) at Kun-Tu-Li-Chun. A battery of the 35th Artillery Brigade was equally successful in the fighting on the 12th October, during which it lost only one officer and six men wounded Such is the character of modern artillery duels, and the chief task of the artillery is, not to destroy the hostile guns, but

merely to threaten them, so as to prevent them from firing upon its own troops.

With a view to increasing the volume of fire, artillery used generally to be deployed in long lines in the fighting line. In the defence a special place was allotted to it on the position, and it formed, as it were, the framework, which was filled in by the infantry; but nowadays, with modern Q.F. guns, the visibility of such lines would render them liable to suffer heavy losses in a short space of time. The long range of the modern gun does away altogether with the necessity for such formations, and admits of massed fire with the batteries dispersed along the whole length of front. It is thus possible not only to concentrate the fire of the artillery on any given point in the hostile position, but also to enfilade portions of the latter. Further, by distributing batteries throughout the whole length of front, their location by the enemy is rendered more difficult, and at the same time they are able to threaten any given point in the enemy's lines. In this connection the skilful posting of the battery in a concealed position is most important. Formerly the crest of a hill was selected, with a view to securing a commanding position; now, however, the quick-firing capabilities and long range of the modern gun render such positions dangerous.

A battery skilfully posted in a concealed position may be able to silence several hostile batteries, thus leaving other batteries free to engage the enemy's troops. The 1st and 2nd Batteries of the 35th Artillery Brigade carried out this duty admirably at the village of Khan-Chen-Pu on the 14th October. Being most skilfully posted, they silenced the Japanese artillery at Sha-Ho Station, thus making it possible for the 4th and 5th Batteries of the same brigade to engage the hostile infantry concentrated at the village of Sha-Ho-Pu.

A well-concealed position is the best security against defeat. In view of this, the following positions are recommended for a battery operating in a hilly country:—

1. The rear slope of a hill.
2. The rear slope of a hill which has two other hills in front of it, the intervening valleys being from 400 to 500 paces wide.

The three hills thus described should increase in altitude the nearer they are to the enemy. Such a position renders it extremely difficult to locate and range on the battery.

At Kun-Tu-Li-Chun three batteries of the 5th East Siberian Artillery Brigade occupied a position similar to that described in (1) above, and successfully engaged 18 hostile guns from the 27th February to the 2nd March, during which time they only lost 1 officer and 18 men. Occasionally for 20 minutes or so the air above the battery seemed full of bursting shells, but the elevation was too high. At such times the battery would remain silent, its gun detachments taking shelter in lightly protected trenches.

During the fighting at Fengschek on the 13th March, two batteries of the 5th East Siberian Artillery Brigade occupied positions in the manner indicated in (2) above. All the enemy's shells burst short of the hollow immediately in front of the batteries.

Widely dispersed batteries require a thoroughly organised system of observation to enable them to cope with the demands of modern warfare. The observers should be distributed over the whole length

of the front occupied, and should have as wide a field of view as possible. Living targets, such as columns, lines, batteries, etc., show themselves ordinarily for a very short time only, and they must be subjected to fire within that time. Flag signalling as a means of transmitting information from the observer to the battery is too slow; the target would have time to hide itself, and the observer using the flag would soon be picked off by the enemy. The best medium for communicating the results of observation is the telephone. It is not only, however, living targets which have to be observed, but the effect also of one's own fire. To do this a battery commander will sometimes have to take up his position at a considerable distance from his battery, in order to be better able to correct its fire; he should, therefore, certainly have with him a telephone. It frequently happens that infantry has to attack localities defended by machine guns, in which cases the most practical way in which the artillery can co-operate with its infantry is by annihilating the machine guns, or at any rate by submitting such localities to a heavy fire. On such occasions the observer (or rather observers) should be as near as possible to the fighting line, preferably with the battalion reserve, where he is in a position not only to obtain information as to the whereabouts of the enemy's machine guns, but also, possibly, to see them himself.

The rapid communication of such first-hand information to the battery cannot fail to be of the greatest assistance. In this case, however, the information must of necessity be communicated by flag signalling.

In modern fighting the frequent changing of the positions of batteries is undesirable. A battery while changing position is useless for fighting purposes, and is liable to suffer heavy losses. Position must, however, be changed either for the purpose of approaching closer to the enemy, or in order to avoid heavy casualties in the event of the enemy having located the battery. In the first place it would be better to bring up fresh batteries from the reserve. These fresh batteries would have a demoralising effect upon the enemy, and at the same time would give confidence to their own troops. Some recommend a bold advance by batteries, especially if the enemy is beginning to waver, but this method lacks justification; the ballistic powers of our guns are so good that a difference in range of a few hundred yards can confer no particular advantage, while the time lost in limbering up, advancing. and taking up a new position would be much better spent in keeping the enemy under fire. In this case it is better to fire several rounds from each gun at the extreme range in the direction of the enemy's rear, especially if there is a possibility of such shots reaching the enemy's staffs or reserves, etc. These rounds will cause little material damage, but will have great moral effect, in that they will indicate that we control the whole field of battle, and will serve to spread the news of our success far and wide through the enemy's lines.

When a change of position is necessary to avoid losses, the guns should be moved by hand for a short distance without exposing them to view.

Before opening fire, the senior artillery commander should make all arrangements regarding observers and the way in which the position will be occupied; all further details will be found in the tactical regulations. Each battery should be furnished with a sketch, showing the various points in the enemy's position, with the ranges and bearing clearly indicated; similar sketches should also be prepared by the

observing officers from their post of observation. In offensive operations these sketches should chiefly contain points along and in view of the enemy's front; in defensive fighting they should also show points in front of our own positions. These plans will make it easier to direct fire upon such targets as may present themselves. The limited time during which living targets generally show themselves necessitates rapidity of action; hence it is obvious that the most suitable fire to employ against such targets is rapid shrapnel fire, based on previously ascertained ranges and bearings. In such cases complete independence should be allowed to the battery commanders, or at least to the senior artillery commander directing the fire of grouped batteries. To wait for instructions from higher authorities on such occasions means the loss of the opportunity for dealing a decisive blow at the enemy. The method advocated above applies only to visible targets.

When firing at concealed objects, especially during the attack, the enemy must be sought out by means of slow fire. In this case observers will be most useful. These, being distributed along the whole front, should easily be able, by noticing flashes, dust, etc., to locate a concealed hostile battery, and may possibly be able to mark its position on the sketch. But for the ranging and for the correction of fire, we require our old type of shells, without which observation becomes extremely difficult. As regards overhead fire, experience has shown that it can be regarded as quite normal. If the gunners are properly trained there will be no danger to one's own infantry. The long range of the gun makes it possible, on the defensive, to place the artillery 900 and even 1,200 paces behind the infantry. Under such conditions the gun detachments would suffer little from rifle bullets, and their fire would consequently be more accurate.

At this distance, moreover, the artillery should be able to sweep the ground close in front of the firing lines, a most important matter for the defence. An example of this will be given when dealing with the defensive action of artillery at night.

At the commencement of an attack the artillery should engage the hostile guns in the manner indicated above, but as soon as the infantry moves forward to the attack, or preferably a little earlier, it should direct the full force of its fire against the point selected for attack, in order thoroughly to demoralise the defenders at that point. As the infantry approaches the hostile trenches, the enemy will unmask his machine guns, usually at a range of not less than 1,000 paces. This will enable the infantry to locate them with sufficient accuracy. This information should be communicated to the batteries at once, and the latter should then use every endeavour to destroy the machine guns, or at any rate to subject them to such a heavy fire as to keep them silent. A continuous fire, chiefly shrapnel, should at this critical phase be directed over the heads of the attacking infantry at the enemy's trenches, so that the defenders may not fire with impunity at the infantry. By selecting suitable targets and making good use of telescopes, the artillery may thus assist its own infantry till the latter is close up to the hostile trenches; but as soon as overhead fire is likely to become dangerous, the battery should slightly increase the elevation of its guns so as to threaten the enemy's nearest reserves. Systematic co-operation of this kind on the part of the artillery will very materially assist the infantry attack. In the defence the action of the artillery will depend upon the targets which present themselves; but in any case, the first objective for its fire should be the hostile artillery. As soon as

the enemy's infantry appears, a portion of the guns should immediately be turned upon it.

11. Artillery in the Defence by Night.

The co-operation of the artillery is an important factor in the defence by night. If skilfully used, it will not only have great moral effect, but will also inflict serious losses on the enemy. Although placed behind the infantry, it will be able to fire over the heads of the latter, and thus sweep the ground in front of the firing line trenches with shrapnel. Fire directed down valleys perpendicular to the front of the position is particularly useful, because such valleys are the natural lines of advance for the attack. In this connection, observation to ensure the correction of fire is most important. The best plan is to post observers in the firing line, and to connect them with the batteries by telephone. To ensure the accuracy of fire directed upon the ground in front, the ranges and bearings to important points in front of the position should be ascertained by daylight, especially if such points afford facilities for the concentration of the hostile infantry. Successful correction of the elevation and direction will remove all danger to one's own troops. The 2nd and 3rd Batteries of the 5th East Siberian Artillery Brigade were brilliantly handled during the night fighting at Kun-Tu-Li-Chun between the 2nd and 7th March, when the batteries were posted as far as 1,500 paces behind the infantry. No special observers were told off from the artillery or from the firing line, but this duty was successfully performed by one of the infantry officers. The front of the position held by the 5th East Siberian Rifle Division was intersected at right angles by two deep valleys, the mouths of which, at a distance of some 700 paces from the front of the position, were closed by two villages. These villages offered the only available cover for the concentration of the enemy's infantry, but the Japanese were successfully driven out of them by the action of the artillery alone.

Artillery fire directed at points in front of the position has also another advantage: the light from the bursting shells shows up the enemy and, although only for a few seconds, enables the defenders to locate objects. Search-lights would, of course, be invaluable on such occasions, but we did not make use of them during the fighting on the Sha-Ho. At Su-Chia-Tun Station we had several search-lights mounted on trucks, and one was employed behind the village of Khan-Chen-Pu, but it gave only a feeble light.

The Japanese used search-lights whenever the nights were dark, and our casualties in consequence were considerably increased.

12. Summary.

1. From the foregoing remarks on the duties of the company, battalion, and battery in action it may be inferred that though the principles governing the art of war remain unchanged, the improvements in firearms as regards rapidity of fire and length of range, and the complicated nature of the modern battle, demand a more extensive education on the part of commanders as well as of the rank and file

2. In order to defeat the enemy, superior forces must be concentrated at the right moment at the decisive point. This principle

still holds good, although the concentration of sufficient strength at the decisive point must be accomplished nowadays in a different manner. Formerly, the infantry approached the enemy in a formation composed of firing lines, followed by reserves in close order, which increased in strength in proportion to their distance from the front. Such a formation is now impossible. The destructive effect of modern fire compels infantry to approach the enemy either singly or in small groups, or thin lines, the nearest reserves being in the same formation. If it is necessary to attack in daylight, the infantry refrains from attacking localities defended by machine guns until the artillery has completely destroyed or silenced the latter.

3. The defensive power of the modern rifle is so great that the first breach in the enemy's lines can rarely be made except by means of a night attack; for it is only under the cover of night that the first tactical success can be gained without disproportionate loss of life. This success can be subsequently confirmed and extended even more easily by day. Night operations are insufficiently dealt with in the regulations—a defect which should be remedied without delay.

4. In connection with night attacks, there is something to be said on the employment of hand grenades. It is desirable that hand grenades should be prepared for action, not by turning a cylinder, but by pulling out a safety pin, this being a more practical method, and safer in the dark. The hand grenades used by us in the later stages of the war were made ready for action by turning a ring. They proved, however, most dangerous, and were the cause of many serious accidents, especially among the men of the 17th East Siberian Regiment. Instructions as to the use of hand grenades should certainly be included in the field service regulations.

5. The ballistic qualities of the modern gun have determined the place which the artillery should occupy in the fighting disposition of a force. Guns will no longer be massed in long, conspicuous lines. The tendency of living targets to conceal their movements and the careful screening of all dispositions on the field of battle, together with the increased powers of the gun itself, have settled the form which artillery fire should take. Formerly the destruction of the enemy's guns was the sole object of the artillery duel; now it is sought to paralyse them by being the first to open fire.

Batteries now come into action in concealed positions, and employ an extensive system of observing stations, in order to achieve the following results, viz.:—

a. To bring fire to bear quickly on living targets.
b. To anticipate the enemy in opening fire.
c. To enable fire to be concentrated on any desired target.

6. Practical experience has shown that artillery can render great assistance in operations by night.

7. The conditions of modern warfare have greatly extended the limits of the field of battle, and the increased power of firearms necessitates greater care in the matter of concealment. The conduct of a battle has thus become extremely difficult. The commander cannot survey the whole field of battle with his own eyes, and must therefore be guided by reports; but as the latter are frequently delayed in transmission, the state of the fight at any given moment is often quite different to what the commander imagines it to be. It is plain, therefore, that under modern conditions the commander cannot exercise

direct control over the battle; hence the necessity for allowing greater latitude to commanders of units, from the company commanders upwards, in the exercise of initiative. But to avoid a misuse of initiative and to ensure its being exercised in conformity to the general plan of the commander, it is necessary that all officers should be educated in the art of war on the broadest possible lines, and that the instruction of the rank and file should be thoroughly practical.

13. Hill Fighting.

Hidden approaches, enabling the enemy to advance without loss, difficulty of maintaining communication, both laterally and from front to rear, and impossibility of complete co-operation between all arms, these are the main points in which mountain warfare resembles night fighting, whilst the facilities for turning and enveloping movements give the attackers a pronounced advantage over the defenders. Owing to the possibility of advancing under cover and to the existence of much dead ground affording complete protection to the reserves, there is seldom any need for the attackers to adopt extended formations. On the defensive, on the other hand, it is very difficult to find a position with a suitable field of fire, and one has often to be satisfied with ranges within the limits of the fixed sight. These conditions enable the attackers to approach in close formations to within effective rifle ranges with impunity.

The difficulty of maintaining communication between units during the advance will render it necessary in future to allow greater independence to tactical units, from the smallest upwards. Individual initiative, as a means towards the attainment of success, is nowhere more important than on hilly ground, where even small groups of riflemen can often render the greatest assistance by making intelligent use of their fire. Hilly ground favours the attacking force in affording opportunities for carrying out turning and enveloping movements. A small force (even one or two companies), supported by machine guns, would produce a crushing effect upon the defenders if launched unobserved against one of their flanks. There were occasions (in August, 1904, with the Eastern Detachment) when the mere threat of a flank attack caused the defenders to evacuate their position.

All the conditions mentioned above as being favourable to the attack in hill fighting are correspondingly disadvantageous to the defence. The broken ground, on and in front of the position occupied, must be examined from the attacker's point of view, a much more difficult task than on open ground, and one which needs experience and a thorough knowledge of requirements on the part of the commander; the arrangement of the details of the plan of defence depends upon a number of possible hostile combinations; the observation of the flanks, and of hidden approaches leading towards the position, demand not only particular care but also a dispersion of forces; the difficulty of maintaining communication laterally and from front to rear, and the separation of different sections of the defence by natural obstacles, preclude the possibility of mutual support by fire, and necessitate independent action on the part of units; the difficulty of handling the reserve, and the necessity in particularly hilly localities of splitting it up, prevent the commander from conducting the battle personally.

It follows, therefore, that defensive operations in a hilly country, should only be resorted to in extreme cases, with a view to delaying

the enemy, and that they should be regarded as temporary expedients to pave the way for a more favourable opportunity. However alluring slopes inaccessible from the front may be, they should never be made a pretext for adopting a purely passive defence; active operations should be undertaken at the earliest opportunity.

It must be remembered that there is no such thing as a defensive position on an absolutely inaccessible height; even if it is inaccessible from other sides, it will always be accessible from that side by which the defenders themselves climbed up.

The most dangerous operation in hill fighting is a retreat, and for the following reasons, viz.:—

1. Units withdrawing from the position will receive only a limited amount of occasional mutual support, or else none at all.
2. There will be no possibility of maintaining proper communication between units hard pressed by the enemy.
3. As the other arms (cavalry and artillery) cannot co-operate in the same manner as on level ground, the whole brunt of the fighting will fall upon the infantry.
4. In the event of a protracted defence ending in a retreat, the attackers will undoubtedly reap the advantages conferred by turning and enveloping movements,[1] and the retiring infantry will have to withdraw under effective rifle and machine gun fire, directed upon them from neighbouring heights.

It will be seen, therefore, that in hill fighting the defence may easily prove disastrous. To make my meaning clearer, I will now deal separately with the action of infantry and artillery in hill fighting, having special regard to offensive and defensive operations by day and by night.

The abundance of cover in a hilly country, as has already been said, renders it unnecessary to attack in extended formations. By utilising covered approaches, the attackers are able to keep their reserves in formed bodies, and in close formations up to within a very short distance of the enemy. The same cover prevents, of course, the defenders from using long range rifle fire, with the result that the actual fighting is of short duration. Having reconnoitred the enemy's position and selected the point of attack, the attackers advance, covering their front with firing lines (*e.g.*, one section from a company). The distance at which such lines will have to be formed depends upon the nature of the hills; the steeper the slopes the nearer will it be possible to approach the enemy without deploying. Open ridges, valleys, or passes should be crossed by men in small groups, or even singly. As soon as the attackers have approached near enough to the enemy to run the risk of serious losses from rifle fire, they should thicken their firing lines to the fullest possible extent. A frontal attack in hilly country presents insuperable difficulties, and entails enormous losses. Every commander is, therefore, morally bound to devise a suitable plan of attack, and to take all measures in his power to minimise losses. A frontal attack up a steep slope

[1] Otherwise there would be no justification for leaving the position, since a frontal attack alone is seldom successful in hilly country.

in face of an enemy is seldom successful; it is better to make a demonstration only in front, and to aim the decisive blow somewhere at the enemy's flank; but it is necessary that the demonstration should be energetic, and sufficiently dangerous to the enemy by reason of its direction. In this connection a correct appreciation of the enemy's position is most important. A feeble demonstration will fail to draw the enemy's attention, and may thus only weaken the main attack. During the advance it is particularly necessary that the companies in the fighting line should support each other by an intelligent use of fire; the smallest chance of enfilading the enemy should be turned to advantage even if such action involves the neglect of the targets lying immediately in front. Small groups may prove most useful by working round to within effective rifle range of the enemy's flanks, and this is not a difficult operation, provided the men are properly trained. By running and creeping forward singly, the men composing these groups can reach suitable positions, and one or two such parties will accomplish more than a whole company. The rapidity of fire of the rifle makes it difficult for the enemy to estimate their strength, and the defenders will often be so much occupied with what is taking place in front that the groups will entirely escape observation. Generally speaking, a characteristic feature of hill fighting is the important results which may be attained by the persistent and independent efforts of small units, such as even sub-sections. Such action shakes the enemy's nerves, leads him to disperse his fire, and distracts his attention, thereby facilitating the task of the troops told off for turning or enveloping movements.

The advantages on the side of the defenders in hill fighting are commanding positions, and complete cover for the sectional reserves, which can thus be kept close to the fighting line.

The chief care of the attackers should, therefore, be to neutralise these topographical advantages, and to engage the enemy's nearest reserves as soon as possible. The latter consideration is of great importance in hill fighting as an aid to clearing up the situation. After a careful study of the ground, the attainment of these objects should be sought by detaching sections, or even whole companies, to occupy such points as crests and ridges, from which it would be possible to enfilade the enemy's nearest reserves, and to support the main attack, if necessary, by using the ground to the best advantage (*i.e.*, by working along ridges, etc.).

The occupation of such points cannot fail to be useful, as it will force the enemy's nearest reserves to keep on the move, especially if a cross-fire can be brought to bear upon these reserves from the points in question.

By making a demonstration of this kind these companies will, if the ground is favourable, be able to draw off a portion of the defender's forces, and will thus lighten the task of the main attack. Machine guns will be extremely useful at such points.

Hilly ground looks quite different by night. Distances appear shorter, slopes steeper, and orientation is very difficult. When, therefore, a night attack has been decided upon, the ground should be studied most carefully. The difficulty of orientation, and of directing night fighting in the hills, makes it risky to attempt an elaborate combined attack, and limits the force which can be employed. I presume that it would be impossible to detail a larger force than a

brigade; and this force should be quite sufficient, because the principal object of a night attack in hilly country is merely to seize some important tactical point. Further success must be deferred till dawn, by which time the point already seized should have been fortified. The enemy will doubtless try to regain at dawn the position which he has lost, but machine guns and entrenchments should suffice to frustrate his counter-attack. The attack should be renewed on the following night, so that the troops are thus gradually pushed forward towards the enemy's main position. This method was adopted with excellent results by the Japanese in the late war, their success being due to the fact that fire, the principal factor in defence, had little effect at night, especially in hilly country. The general character of a night attack has been already described by me under the head of "Infantry in the attack by night," and I will, therefore, now merely emphasise the following points, viz.:—

1. The last reinforcement of the firing lines should be carried out as close as possible to the enemy.
2. The utmost use should be made of demonstration by fire.
3. Communication should be maintained by means of lamp signalling.

The method practised by us of signalling with lamps by adapting the semaphore symbols (one lantern being carried on the chest and one in each hand), was of little use. The signaller is usually obliged to take up his position on a height and, even if the side of the lantern nearest the enemy is darkened, the light will fall on the slope facing the enemy, who will thus be able to locate the signal station. Transmission of messages by this method is, moreover, slow, and mistakes are apt to be made. It will be quite sufficient if every commanding officer knows where his unit is. This might be ensured if each battalion in a regiment were provided with lanterns, at the rate of one per company, of a distinctive colour; for example, red in the 1st battalion, blue in the 2nd, white in the 3rd, and green in the 4th. The signallers would momentarily flash these lights from time to time, thus enabling the commander of a battalion (a big unit in night fighting) to locate his companies with accuracy. In transmitting orders, too, a messenger will always be able to find the company by watching the flashes.

A frontal attack in a hilly country, as has already been said, presents insuperable difficulties, and is attended with enormous losses. The success of the attack hinges principally upon successful action on the flanks, *i.e.*, turning and enveloping movements. Hence it follows that, when taking up a position, the defenders should pay the most careful attention to their flanks, and protect them from direct attack. On level ground the fight develops gradually, and the enemy's flanking movements may be detected in good time, and can always be met by the local reserves. The conditions are quite different in hill fighting, where the enemy's success reveals itself only at the last moment, when it is often too late to bring the local reserves into action or when there is only time enough for them to attack straight to their front. The difficulty of maintaining communication and of handling the reserves hampers the defenders considerably, and necessitates posting the local reserves as near as possible to the fighting line. I have already indicated the advantage to be gained by occupying points, such as ridges and heights, from which it is possible to

paralyse to some extent the action of the nearest reserves by firing on them. This method, which was confirmed by the experience of the late war, will be adopted in future, and it is, therefore, necessary, when selecting a position for the local reserves, to see that it is not exposed to the possibility of a cross or enfilade fire. In defensive fighting in a hilly country it is most difficult to reinforce the fighting line from the rear, so that the local reserves should be posted in positions from which they can render immediate support by fire. They should, therefore, be posted within 400 to 600 paces of the fighting line. When taking up a position, the companies in the fighting line should be particularly careful to strengthen the front of their sections so as to secure them against a direct attack. Trenches on ground which is easily accessible to the attackers should be traced with a view to giving a cross fire, but company commanders should be careful to ensure that such trenches are themselves not liable to be enfiladed by the enemy's fire. It is often useful to provide a few additional short trenches some 20 paces or more in front of the main position, capable of holding not more than a section each, and so designed as to enable their defenders to enfilade the enemy's firing lines at the critical moment. These trenches should be so placed that the enemy will not be able to discover them till the last moment, when the astonishment produced by their sudden revelation may throw the enemy into confusion, and thus delay him under heavy rifle and machine gun fire.

These supplementary trenches should have natural or artificial ways of communication connecting them with the main position, from which it should also be possible to enfilade them.

Speaking generally, the fundamental principles governing the construction, for defensive purposes, of trenches in hilly country are that there should be no dead ground, and that all parts of the defence should be able to support each other mutually by fire. These considerations demand a comprehensive survey of the position from the point of view of the attack.

The flanks of the position should be protected by closed works against direct attack.

The battalion reserves may be employed either in strengthening the companies in the fighting line where necessary, or in acting independently at the decisive moment. In either case the position of the battalion reserve should be as close as possible to the fighting line, never more than 100 to 200 paces from it. If a ridge or height, in rear of the position, offers facilities for supporting the fighting line by fire, such a point must be occupied. If the companies in the fighting line are driven back, the battalion reserve covers their retreat with its fire, and takes the place of the fighting line until the latter is reformed. As soon as information of the enemy's advance is received, all troops should take up their positions. More detailed information, such as the strength and composition of the hostile forces, and the direction of their advance, is usually received later, and is sent direct to the higher commanders (*i.e.*, commanding officers of regiments and their superiors) from the outposts—which have special instructions to withdraw in a certain direction—and from the mounted picquets thrown out to the front. The consequence is that commanders of battalions and companies, who are sometimes forced by circumstances to act on their own initiative, are absolutely ignorant of the strength of the nearest hostile forces. Such ignorance regard-

ing the enemy is apt to have a dispiriting effect upon both officers and men. Moreover, in a hilly country, where a hostile force may suddenly make its appearance on high ground in front of the position, information regarding the enemy's movements is of special value to company and battalion commanders. I would, therefore, suggest that the companies in the firing line should send forward scouts [1] to the nearest height as soon as information of the enemy's advance is received. These scouts should work at an interval of some hundred paces and, if sent out early in the day, by making use of covered approaches, they should reach their ground without danger of coming under the fire of their own side. If there is a clear field of fire extending over 1,000 paces or so, it will be unnecessary to send out these scouts.

In defensive operations in a hilly country at night, reliable scouts posted in front of the position are exceedingly useful. They should be sent out a comparatively short distance only—generally some 200 to 300 paces in front of the line of obstacles. This will suffice to enable them to detect the enemy's advance in time, and to cause him, in all probability, to open fire prematurely. The scouts should retire in a pre-arranged direction, in order to avoid masking the fire of their comrades.

As soon as the enemy's attack thoroughly discloses itself, fire should be directed at the obstacles, and hand grenades should be freely used.

In hill fighting the factors, which determine the action of the artillery and the kind of fire to be used, are the same as on open ground, viz., the necessity for paralysing the enemy's guns, and overwhelming his living targets with rapid fire. The facilities for coming into action from concealed positions are greater in hilly country than elsewhere, but while the hills favour artillery in this respect, on the other hand they limit its field of fire. As direct laying can seldom be resorted to in hill fighting, and as it is difficult to observe the effect of fire, the artillery should employ as extensive system of observation posts.

In offensive fighting the task of the artillery is more multifarious than in open country, for, in addition to engaging the enemy's artillery and living targets, it may be called upon to deny to the defenders certain important points, such as heights, ridges, &c., the possession of which would facilitate the progress of the attack. A continuous fire should be directed at such points until information is received to the effect that they have been secured by the infantry. Cross fire should be brought to bear on the enemy's lines, to effect which the artillery should be distributed over the whole length of front taken up by the attackers. Direct fire will have little effect, as the amount of dead ground, and the numerous small folds, will afford ample cover to the enemy's reserves.

Oblique fire, approaching as nearly as possible to enfilade fire, will be the most useful. Owing to the difficulty of locating reserves and other targets on hilly ground, it is unwise to open fire from all the guns simultaneously. It is better to save ammunition by telling off certain batteries to prepare the way for the assault; these batteries should remain silent until the infantry approaches the point selected

[1] One scout from every two companies should be sufficient.

for the assault, when they should open the heaviest possible fire on that point.

A change of position with the object of getting closer to the enemy is very useful in hilly country, especially with a view to securing a better field of fire. It is particularly important that batteries operating against the defender's flanks, should be boldly handled; by getting into a position whence they can enfilade the position at decisive ranges, they will be able to overwhelm the enemy's reserves at the artillery on open ground.

A change of position in hilly country by a mountain battery with pack equipment is not such a difficult operation as with ordinary field artillery on open ground.

By taking cover behind ridges a mountain battery can easily change its position unobserved, and will suffer no losses during the movement. The defenders will, of course, keep a sharp look out for the smallest signs of a move on the part of their opponents, so that, if the ground does not favour a change of position unobserved by the enemy, it is better to move at night. The new positions for the batteries may be selected during the day, and sketches[1] of them should be prepared. In the evening a few men may be sent forward to mark them out.

Bold handling of batteries is more feasible in hilly, than on open ground. Sometimes, even in daylight, some signs of disorder, such as hurried movements of reserves, shifting of guns, etc., may be observed on the enemy's position, indicating that something is amiss. At such times the attacker's batteries even in daylight may push forward boldly to new positions, or batteries from the reserve may be brought closer to the enemy with little risk. The fact that the enemy has begun to shift his guns shows that his observation is defective, and there will, therefore, be no great danger of suffering losses from his fire. The new positions of the batteries, being nearer to the enemy, may enable them to shoot down the latter's gun detachments and prevent his infantry from removing the guns. This is what the Japanese did, and we, in consequence, lost our guns.

At night the fire of the attacking artillery may render valuable assistance to the infantry. If the ranges and bearings to various points in the enemy's position are ascertained by day, the batteries will be able to fire by night with success. The defender's artillery will doubtless try to support its own infantry with its fire, in which case a heavy fire directed against it will paralyse its action, without, however, endangering the attacking infantry. It is, moreover, sometimes necessary to prevent the defender's reserves from occupying certain points which might assist them in repelling the attack; in this case, an energetic shrapnel fire directed at such points will often save one's own infantry from unnecessary losses.

The defender's artillery should certainly be concealed from the enemy's view, and the batteries should be dispersed.

A study of one's own position from the attacker's point of view may assist one in disposing the artillery. Batteries in the defence should be posted in such positions that they can bring a cross fire to bear upon all possible positions for the hostile artillery. If it is contemplated that it will be necessary to change the position of the

[1] The use of these has already been explained on p. 333.

guns, with the object of firing upon the nearest points which the attackers might conveniently seize, such new positions should be fortified beforehand, and measures should be taken to ensure observation from them being carried out at the critical moment without loss of time. Further details regarding the employment of fire by artillery in the defence, changes of position for short distance by hand under cover, and co-operation with infantry both by day and night, will be found under the heading of "Artillery,"[1] and the principles there mentioned are equally applicable to mountain warfare. I will merely add that it would be a distinct advantage if guns were provided with shields, in view of the danger to which they are exposed from rifle fire at short ranges.

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[1] Para. (10), p. 331, *et seq.*

STUDIES IN APPLIED TACTICS.

CAVALRY IN BATTLE (15TH AND 16TH AUGUST, 1870).

By P. LEHAUTCOURT.

Translated by permission from *Le Journal des Sciences Militaires*, By Major E. MAKINS, D.S.O., 1st Royal Dragoons.

Continued from February JOURNAL, p. 246.

III.

RHEINBABEN'S CAVALRY ON AUGUST 15TH.

ON August 14th at 6 p.m., Prince Frederic-Charles issued the following order to the II. Army: "No other important news has arrived here (Pont-à-Mousson) from Metz. 1. The X Corps will concentrate to-morrow on the left bank of the Moselle, and continue to watch the valley towards Metz while reinforcing its advance guard."

Then come some orders dealing with the Guards who were to close up on Dieulouard, with an advance guard at Quatre-Vents; the IV. Corps was to go to Custines, with its advance guard and cavalry to Marbach; the III. Corps with the 6th Cavalry Division—which had joined it since the beginning of August—was to march on Cheminot; the IX. Corps was to remain at Buchy, the II. Corps was to advance to Han-sur-Nied and Falquemont; the XII. Corps was to go to Nomeny and Solgne.

The II. Army had four divisions of cavalry, the 5th and 6th, and those of the Guards and Saxons (XII. Corps). If ever there was an occasion when this arm should have been employed massed, it was now. The Army Corps of Frederic-Charles were already on the Moselle or near it. Their future operations depended essentially on the action of our troops. In order to discover this there was no other way of employing these masses of cavalry, except to give them, as an objective to march on, the three roads from Metz leading to Verdun, *via* Mars-la-Tour, Etain and Briey. In the order of August 14th there is no indication that the Prince had ever thought of this. His four Cavalry Divisions were under the orders of his Army Corps: two of them, the 5th and 6th, by his express desire. He only mentions the 5th and Guard Divisions incidentally: "His two cavalry brigades (those of the Guard) will push further forward and get into communication with the 5th Division. . . . " As regards the 6th Division, he limits himself to pointing out that it must follow the fortunes of the III. Corps.

Let us see how General von Voigts-Rhetz, commandant of the X. Corps, translated into positive terms, the intentions sketched out by the Prince. Here is the order which he issued (9.30 p.m.) after receiving the former:

". . . . The X. Corps will remain to-morrow about Pont-à-Mousson, with the 19th Division holding the left bank, and the 20th Division and Corps Artillery the right bank. The 19th Division will station an advance guard of four battalions, two batteries, and two squadrons at the place where the roads from Thiaucourt and from Fliret cross. It will increase the detachment of Vaudières to two battalions, one battery, and one squadron. . . . The 20th Division will relieve the detachment of the 19th Division with a force of two battalions, two companies Chasseurs, one squadron with two guns, ... The remainder of the 20th Division and Corps Artillery will remain in their positions of this day. . . .

"General von Rheinbaben will remain at Thiaucourt and send forward strong parties in the direction of the Metz-Verdun road—*via* Mars-la-Tour. Bredow's Brigade, which arrived to-day at Pont-à-Mousson, will leave its bivouac at 5 a.m., and march on Thiaucourt. General von Rheinbaben will be responsible for the communication with the Guard cavalry, and from the break of day will reconnoitre with numerous patrols the roads towards the valley of the Moselle. . ."

Thus the X. Corps prepared to hold the passage of this river at Pont-à-Mousson, while sending forward detachments to the West and to the North; the main body of the army remained, even to the east of the Moselle, taking up a defensive attitude entirely opposed to the requirements of the events up to date, and also of the general situation. A surprise was actually feared. At 11.45 p.m. the commander of the Corps Artillery reported that his bivouac "appeared to be safeguarded against a surprise from the left as well as from the right bank of the river."

As to Rheinbaben, he was to stay himself at Thiaucourt, while pushing strong parties to the Metz-Verdun road, and reconnoitring actively in the direction of the Moselle—which latter instruction is difficult to understand, for it was not in the direction of this river where the danger lay, but well to the North. In fact, the instructions of Voigts-Rhetz were not such as would give the stimulus to this cavalry General, who required it badly, but rather to inspire him with an untimely prudence, at a time above all others when he ought to have dashed forward.

It was not till after midnight that the commander of the 5th Division issued his orders for the 15th. General von Redern was to leave one of his three regiments (10th Hussars) at St. Benoit on Thiaucourt-Verdun road, while he himself with six squadrons (17th Hussars, and the 2nd and 5th squadrons, 11th Hussars) collected at Beney and St. Benoit, together with one battery, was to advance at 4 a.m. on Lachaussée. From there he was to send on some detached squadrons to the Metz-Verdun road by Mars-la-Tour, and to the North. From Chamley, to the East, Captain von Baerst was to take to Rezonville, by the same road, the two squadrons of which he had command (1st and 4th squadrons, 11th Hussars).

The two bodies, thus sent forward to this main road, were to have as a mutual support the 4th Cuirassiers, which General von Barby was to lead at 4 a.m. from Thiaucourt to Dommartin. He himself, with this regiment, was to reconnoitre as far as the same road. As regards the remainder of Barby's Brigade, one part (19th Dragoons, 3rd squadron 13th Uhlans) was to remain at Thiaucourt as a reserve for the Division; two squadrons (1st and 2nd squadrons 13th Uhlans) were to act in the same way at Flirey; while another (4th squadron

13th Uhlans) was at Paquy reconnoitring towards Metz. It can be seen how these two Brigades were going to be scattered. Their six regiments, if concentrated, would constitute a powerful force, capable of striking a severe blow. Scattered thus and widely separated into five groups, of which the strongest was in reserve at Thiaucourt, they could not in any one place obtain any appreciable result. To be in reserve was a singular rôle to give to squadrons, the essence of whose power is mobility! General von Rheinbaben himself did not take any part in the "exploration" of the 15th, and he did not even give precise instructions to the bodies sent on to the Mars-la-Tour road.

On August 15th, at 4 a.m., the X. Corps stood ready to fight round Pont-à-Mousson, where we had never thought of fighting.

The Army of the Rhine was in full retreat from Metz to the Gravellote plateau. Voigts-Rhetz was not slow to realise that no attack was to be foreseen. He pushed on his brigade advance guard to the bifurcation of the road to Flirey and Verdun, the remainder stopping at Pont-à-Mousson.

Meanwhile, two officers had been sent towards Metz, one on each bank of the Moselle. The first one reported from Corny at 6 a.m., that, on the preceding night, a loud rumbling of wagons had been heard to the North-West. A patrol of the 6th Cavalry Division got into the vicinity of Gravelotte, finding French outposts there, and hearing the noise of troops marching towards Verdun.

Our non-appearance in front of Pont-à-Mousson and the previous report modified quickly the ideas of Voigts-Rhetz. He sent Rheinbaben fresh instructions: the commandant of the 5th Division was to advance in force immediately on Fresnes-en-Woëvre, *i.e.*, to the Verdun road by Mars-la-Tour, to try and stop us. Thiaucourt was to remain occupied by a regiment with carbines, to act as a support. In the same message Voigts-Rhetz told Rheinbaben that he enclosed a copy of the report from Lieut. von Willich, a copy which, owing to a mistake, frequent enough on the staff, it was forgotten to attach to above-mentioned document.

Thus Voigts-Rhetz, like Frederic-Charles, imagined that we had retreated much further than we really had; he thought that at Fresnes-en-Woëvre Rheinbaben would get in front of us or would get in touch with the flank of our columns. This opinion is admissible, in the light of the information, which had been received up till then by the commander of the X. Corps. Still, ought not the 5th Division to have acted concentrated, so as to constitute a force to be reckoned with, and ready to fulfil the delicate task which would fall to its share in the face of an enemy superior in numbers? Instead of this, Voigts-Rhetz ordered him to leave a regiment "armed with carbines" at Thiaucourt, which was a place of no importance, being only a village like any other in La Woëvre. If it had been a question of a bridge over an unfordable river, or a defile in an impracticable country, well and good; but on the plateau between the Meuse and the Moselle, a position to retire on, held by cavalry is worse than useless. In case of a check, the Division would have been obliged to choose Thiaucourt as its line of retreat, instead of enjoying liberty to move as it liked on this great plain, which was so suitable for cavalry action.

Rheinbaben received the order of Voigts-Rhetz at 9.45 a.m., at Thiaucourt. Although the dispositions which he had made were different from those which he had been ordered to take up, he contented himself with merely reporting his action. Thus, instead of

going forward "in force" to Fresnes-en-Woëvre, he went on scattering his Division between Lachaussée, Dommartin, Chambley, Les Baraques, and ordered the different parties to reconnoitre the Metz-Verdun road. He evidently thought that we had not advanced so far to the West, as the commander of the X. Corps had given us credit for.

Just as he was going to send back his report, he learnt through a report from Lachaussée, timed 8 a.m. that Redern's Brigade had not encountered any French troops on the road from Verdun to Latour-en-Woëvre, and Hannonville. But, on the contrary, the 4th Cuirassiers had seen a French regiment of Dragoons near Puxieux. This time, Rheinbaben took the initiative very justifiably, and went with the 19th Dragoons towards this village. The information was correct but incomplete. Was it an advance guard, a flank detachment, or part of the Metz garrison? Were our troops in retreat *via* the Etain and Briey roads, and had they left near Mars-la-Tour a rearguard to cover their movement? These were some of the problems to be solved.

However, the two squadrons from Chambley (1st and 4th of the 11th Hussars) advanced at 5 a.m. to Rezonville, detaching patrols to Vionville and Mars-la-Tour. There was a thick fog which did not lift till 7 a.m. At 6 a.m. from the south-west of Rezonville, Captain von Baerst saw a very strong column of cavalry, marching along the Verdun road. It was Forton's Division. Without waiting to be attacked, he retired *via* Xonville to Lachaussée, to which place he knew General von Redern was to come, but he continued to watch our cavalry on the left flank. As we have already seen, Forton sent a squadron of 1st Dragoons after him, and then the whole regiment. It was the presence of this regiment at Puxieux which was going to be discovered by the 4th Cuirassiers, and which would decide Rheinbaben to advance in this direction with the 19th Dragoons.

As it was, Captain von Baerst brought back his squadrons to Xonville, where he met those of Redern. He had captured a few of our Dragoons, almost without loss to his own Hussars.

Rheinbaben himself was at Lachaussée at 8 a.m. with four squadrons and a battery. Learning that the French cavalry had come from the North-West to Puxieux, he took this direction, collecting on his way several outlying squadrons, who, like himself, were looking for the enemy. In this manner, thanks to the initiative of the junior officers, the inconveniences of being scattered were less than in Rheinbaben's Division. Gradually, in addition to the four squadrons and a battery from Lachaussée, Redern collected in this way under his orders two squadrons of the 11th and 17th Hussars, detached to Hannonville and Latour-en-Woëvre, the two squadrons of Captain von Baerst, and the squadron of the 4th Cuirassiers coming from Chambley. Total: nine squadrons, before whom the 1st Dragoons and afterwards Murat's whole brigade retired to Mars-la-Tour, as we have seen. Redern thus pushed on as far as Puxieux, and his battery opened fire, at first from the outskirts of Sponville, and afterwards from the South of Mariaville farm. The whole action was limited to the harmless cannonade, described by us. Both the opposing cavalry forces contented themselves with watching each other, showing no desire on either side to come to close quarters.

Paucity of numbers justifies up to a certain point this attitude of the Prussians, who, however, possessed certain advantages. Moreover they soon got fresh reinforcements, galloping to the sound of the guns from all points of the compass without orders, or in spite of orders to the contrary, but all were filled with the spirit of mutual support, which must be admired, and which is far from existing amongst ourselves. Thus there were only three squadrons left on Thiaucourt-Verdun at Benoit. Of his twelve squadrons, Redern only had one away, which was reconnoitring towards Nancy. On the other hand, the 4th Cuirassiers were placed absolutely at his disposal. Instead of keeping in hand these fifteen squadrons, he contrived to leave the Cuirassiers to the south-west of Puxieux, while he approached with the remainder the Verdun road, between Hannonville and Mars-la-Tour.

General de Forton had posted two squadrons of Dragoons dismounted on the edge of the wood, west of Mars-la-Tour. Their fire stopped short the German horsemen, although the latter were reinforced by a fresh regiment, the 19th Dragoons, who arrived from the neighbourhood of Thiaucourt (12.30 p.m.). Redern had nineteen squadrons under his command near Mars-la-Tour. In spite of their numerical inferiority, Forton's Division felt that an attack was so unlikely that they watered their horses in the village.

Nevertheless, the Prussian General finally decided to attack. He had already begun some preparatory movements when Rheinbaben came unexpectedly to Puxieux (about 1 p.m.). Being informed of Redern's plan, he forbade its execution without the least hesitation under the singular pretext that "the numerical superiority of the opponent gave no hope of success." He had however, nineteen squadrons and a battery at his disposal, of which it is true Redern had left four to the south-west of Puxieux. Forton had only 15 squadrons and two batteries to oppose him. The two other Divisions of Generals du Barail and de Valabreque were still some way off, one at Jarny, and the other at Rezonville. Besides, Rheinbaben did not know they were near. Under these conditions it is difficult to explain why the Germans did not take the offensive.

The commander of the 5th Division thought fit to send to General von Voigts-Rhetz the following message:—

"I arrived at 12 noon (?) with five regiments and a battery at Tronville. I have run up against the enemy's cavalry and a battery: who, though stronger in numbers, retired soon after on Metz (?). Some light cavalry came near at the same time from Metz (?). Bredow's Brigade will probably soon join me. I intend to remain at Tronville, or in front of it, towards Metz: communication with the I. Army has not yet been re-established."

Doubtless the fault of inaccuracy and even of obscurity will be noticed in this message. It is difficult, even nowadays, when all the facts of the situation are well known, to explain what Rheinbaben meant. There was all the more excuse for Voigts-Rhetz, who had insufficient data to go on. He could only draw one conclusion, which was that, in spite of our numerical superiority, we had given way and retired towards Metz owing to the pressure from Rheinbaben. This prompt retirement tended to show that he was dealing with a rearguard, a flank detachment, or part of the fortress garrison. Each of these suppositions was admissible.

A little time after the despatch of this message, the German cavalry received other reinforcements: two squadrons of the 13th Uhlans (1st and 3rd): then after 2 p.m. Bredow's Brigade. The latter had left Pont-à-Mousson, on an order from Voigts-Rhetz, moved quickly over 20 kilometres "under a burning sun," and had just gone into bivouac at Bouillonville to the south-west of Thiaucourt, when an orderly brought an order for it to rejoin Redern as soon as possible. Bredow left at midday and arrived quickly at Puxieux, having left the 13th Dragoons at Bouillonville for some unknown reason. At 2.15 p.m. Rheinbaben had at his disposal 29 squadrons and 12 guns, that is to say, a force amply sufficient to drive back Forton's Division even if it had been supported by the neighbouring ones of de Valabreque and du Barail. The Germans were, moreover, concentrated under one chief commander, while ours were under three; and two of these divisions were some way off. The first could have been beaten before the others could have come up, a fact which entailed a great advantage. Rheinbaben had the means of fulfilling his mission, which he had not yet been able to do. A fresh order from Voigts-Rhetz, timed at 9.30 a.m., reached him about this time.

This order of 9.30 a.m. had been written in consequence of fresh instructions from Frederic-Charles, from Pont-à-Mousson at 7 a.m. "Portions of the I. Army during yesterday afternoon drove back towards Metz some important hostile forces. . . . .H.M. the King orders that all available forces on the left bank of the Moselle shall at once advance towards the Metz-Verdun road and Metz, so as to make it quite clear whether the bulk of the enemy's forces has already retreated from Metz, or whether it is about to begin such a move. For this operation, I tell off the X. Corps with the two brigades of Rheinbaben's Division under the orders of Your Excellency. The cavalry must be pushed forward as quickly as possible up to the Metz-Verdun road, and follow it up towards Metz, until it can clear up the situation for certain.

"The Dragoon Brigade of the Guard Cavalry Division, which has spent the night at Rogéville, will receive orders to march to Thiaucourt. Your Excellency can give it orders there.

"You must feel to the left to get touch with the I. Army. . ."

The order of Frederic-Charles only reached Voigts-Rhetz at 9 a.m., although, like the Prince, he had his headquarters at Pont-à-Mousson. At 9.30 a.m. he had settled on a second plan for August 15th. It will be seen that it still more distorted the original idea of Moltke:

"Some bodies of the I. Army drove back during yesterday afternoon on Metz considerable forces of the enemy. . . . The 5th Cavalry Division, the Dragoon Brigade of the Guards, and the 19th Infantry Division (the King mentioned "the available forces" on the left bank) will advance to-day to the Metz-Verdun road. General von Rheinbaben has already been ordered to march on Fresnes-en-Woëvre. I shall send on to him the regiment which he left at Thiaucourt, as soon as other troops shall have arrived there. From Fresnes he will wheel towards Metz and march along the Metz-Verdun road on Metz until it can clear up the situation. He will try and get communication on his left with the cavalry of the I. Army. He will report to me this evening from wherever he in-

tends to spend the night and will establish a system of orderlies to connect with me."

Thus, the first duty of the 5th Division was "to try and stop the enemy (versucher den Feind zum Stehen zu bringen), according to the words of the order for the X. Corps, timed 8 a.m. In the fresh instructions of Frederic-Charles, Voigts-Rhetz ordered Rheinbaben to go back along the Metz-Verdun road so far as to "clear up the situation." It was evidently supposed that our army had not advanced so far West as had been allowed at first. However, the mission of the 5th Division was an offensive one, which was very different from its attitude on the 15th.

As regards the order to establish connection with the I. Army to the left, that is to say to the north of the Metz-Verdun road, it was based on the false supposition that the I. Army would have, like the II., thrown some cavalry to the west of the Moselle, in order to reconnoitre to the north-west of Metz. There was none. The two Cavalry Divisions, at the disposal of Steinmetz, had not imitated the activity, quite moderate in other respects, of the 5th and 6th Divisions of their own arm.

In short, the original plan had perceptibly deteriorated in passing from the King's Chief of the Staff to the 5th Division.

It was a fresh proof that the re-attachment of the 5th Cavalry Division to the X. Corps was an error on the part of Frederic-Charles. Except in the case of short periods or in view of some specially arranged object, Cavalry Divisions, whether detached or concentrated, should be under the orders of the Commander of the Army, who alone is able to direct their march correctly and know what their true objective should be. The multiplication of the channels of transmission necessarily conduces to render less exact the executive orders.

But to return to Rheinbaben, it was not the mere temporary contact with Forton's squadrons that could clear up the general situations. He had to rend the veil, and penetrate as far as the infantry of the Army of the Rhine. In order to do that, he had no other course but to fight. But Rheinbaben was not a whit more enterprising, nor was he infused with the cavalry spirit any more than was the Marquis de Forton; he, therefore, rested content with the meagre results which he had obtained. If, in the evening in spite of his comparative inactivity, he succeeded in gathering some information of great value, he owed it entirely to the incredible negligence of our service of security. Still this valuable information never reached the Commander of the Army in sufficient time.

In order to justify this attitude of exaggerated prudence, it has been argued that the horses were tired. But they were not so much so that they could not have charged. Besides, ours were still more done up after many marches, which had been conducted under bad arrangements and under the crushing weight of an extremely ill-conceived equipment. Like the enemy, they had been on the march from 4 a.m. Under these circumstances, neither combatant was better off than the other.

As it was, Forton and Rheinbaben went into bivouac at quite a short distance from each other. The former had his two brigades to the west of Vionville, as we have seen. As regards Rheinbaben's Division, Barby's Brigade bivouacked to the south-west of Puxieux first of all, and then in the evening to the north of Xonville;

Redern's Brigade bivouacked to the north of the same place, and Bredow's Brigade to the east of Suzemont, on the road to Verdun.

At 3 p.m. Rheinbaben sent Voigts-Rhetz a fresh message: "Six cavalry regiments (?) and three batteries (?) have just appeared in front of me, and have been driven back (?) on Metz. I have posted outposts to the west of the Bois de Dame, with their left on the Metz-Verdun road. I am not able to push further forward because there is no water (?) . . . I am trying to get connection with the I. Army. Losses slight. . . . ." There is no need to emphasise the inaccuracies of this report. They are flagrant and the report is little calculated to enlighten the executive. The only conclusion which could be drawn from it was that Rheinbaben had in front of him very limited forces. This belief was already the dominant tendency with our opponents. They could only be the more deceived concerning our situation.

A little later, certainly before 5 p.m., Rheinbaben reported that there were some French infantry and artillery at Ancy on the Moselle, but that for the time beng "there was no enemy to be seen" "in the direction of Metz." "In der Linie von Metz, ist augenblicklich kein Feind zu sehen." An incomprehensible misstatement of a nature to entirely deceive Voigts-Rhetz and Frederic-Charles, and to cap everything he had neglected to give the time and place of departure on this peculiar message.

Moreover, some reports which Rheinbaben received, soon modified his conclusions. From several directions it was reported that there were French cavalry and infantry outposts in front of him. Even at a short distance from this outpost screen a large bivouac at Rezonville, that of the 2nd Corps, could be seen. Two officers, Lieuts. von Hirschfeld and Dietze, had been sent out reconnoitring at 5 a.m. from Mariaville on Vionville. The first named pushed back with dismounted action a cuirassier picquet; but another cavalry picquet, which the second officer met, opened such a heavy fire that it was supposed to be composed of infantry. It was estimated that there was a large force of all arms, bivouacked on the slopes to the west of Rezonville, and as near as possible 20,000 men who were engaged in cooking their dinners.

This report had no sooner reached Rheinbaben than he sent Voigts-Rhetz a new report (5 p.m.). "According to a report just received, some infantry are marching in the direction of Tronville and Puxieux. It would be a good thing to send infantry from Thiaucourt to Dommartin. A reconnaissance has revealed that some of the enemy's vedettes are at Vionville, and a large camp of all arms at Rezonville." Here was information of the greatest importance to the Commander-in-Chief.

Up to that time only cavalry had been seen to the west of Metz; and it was conceivable that it was either covering the retreat of our army, or acting as a flank guard to the movement. The presence of infantry in force to the west of Rezonville showed, on the contrary, that either we had not yet advanced so far to the West as had been thought hitherto, or that we had formed a strong rear guard, while we stole away to the North-West.

In spite of its great importance, this report of Rheinbaben did not apparently get beyond the staff of the X. Corps, who received it without doubt about 6.30 p.m., although the original, preserved in the Berlin Record Office, gives 5.30 p.m. by mistake. It was con-

sidered of no great importance and was very probably chucked into a despatch case. If a copy did happen to reach the general staff of the II. Army, it was only to fall into hands unconscious of its value. One fact is certain, and that is, that it was not taken into consideration in the working out of the orders for the 16th. The same fate overcame Lieut. Dietze's message. It is unknown whether it even arrived at the general staff of the X. Corps. A double negligence, which shows how the transmission of information, even the most important, was at times in fault on the part of our opponents.

Thus, thanks to our faulty service of security, Rheinbaben's Division gathered much more data than they should have done; but the supreme head of affairs was not the better enlightened as to the general trend of the operations. Whether Voigts-Rhetz and above all the Chief of his Staff, Lieut.-Colonel von Caprivi, had been able to grasp the broad lines of the situation, Prince Frederic-Charles was, at any rate, entirely ignorant of them in the evening of the 15th.

The order of Voigts-Rhetz was to the effect that Rheinbaben's Division was to try and gain touch with the I. Army. The 1st squadron of the 16th Uhlans was given this duty by General von Bredow. It was to advance to Jarny, and from there detach patrols to the North, in which direction it was wrongly supposed that the two Cavalry Divisions, belonging to Steinmetz had detached parties.

It is difficult to explain the choice of a squadron without carbines for this mission. It could have easily got into difficulties.

As it was, it passed through Mars-la-Tour at 3.30 a.m. and reached Jarny, which was searched by the advance-guard. It had just passed through this latter village, when Captain von Wulffen saw a troop in bivouac in a hollow to the East. After a short examination he took it to be a battalion with two squadrons. In reality it was simply the wagons of du Barail's Division, without any infantry.

At the same time the advance-guard troop of Uhlans came across the French outposts, and retreated as quickly as possible, followed closely by the Chasseurs d'Afrique. They reached Hannonville with difficulty and from there the regimental bivouac. This reconnaissance was abortive and cost the 16th Uhlans serious losses, owing mostly to the want of skill of Captain von Wulffen. At the same time a detachment which was sent to requisition at Moncel had, according to its own account, been attacked by a "company." But we had no infantry in this direction.

Rheinbaben, nevertheless, sent an account (7.45 p.m.) that the squadron, which had been sent towards the I. Army had encountered four hostile squadrons and a battery at Jarny. He added that in case of necessity, he himself would retire on Verdun. Unhappily for us, this peculiar message, so well calculated to mislead the German staff, never reached Voigts-Rhetz until the morning of the 16th, at Woël, as the Commander of the X. Corps had already left Thiaucourt. Therefore it had no effect on his plans.

Another squadron of the 16th Uhlans (2nd) had advanced to Mars-la-Tour to support the 1st squadron. Its patrols caught a workman going from Metz to Verdun. When questioned, this man, who pretended to be a German, declared that the villages between Metz and Vionville were alive with troops, numbering at least 100,000 men; that Napoleon III. was at Metz on the night of the

14th (an incorrect statement as the Emperor had left Metz in the afternoon), but that, since then, he had left the army; and that General Bazaine's headquarters was at Gravelotte.

This information was of the highest importance, surpassing in interest any which had come in on August 15th. However, it did not reach Frederic-Charles any more than the former had done. Captain von Porembsky sent the workman with a N.C.O. to the Commander of the 16th Uhlans. The prisoner then and there disappeared, and there is no more trace of him or of his disclosures. Perhaps the N.C.O. encumbered with his capture, dispatched him without any form of trial; anyhow, it is certain that Rheinbaben, Voigts-Rhetz, and *à fortiori* Frederic-Charles were ignorant of what Porembsky had learnt by such good luck.

A schoolmaster, captured at Ancy, had given similar news, but in this case Colonel von Lyneker had hastened to communicate it to Voigts-Rhetz (7.45 p.m.). A fresh proof that it is not sufficient to merely collect information, but that it must be transmitted in good time as well.

(To be continued.)

THE FRENCH AND GERMAN FIELD ARTILLERY: A COMPARISON.

By Lieut.-General H. ROHNE.

Translated by permission from the *Jahrbücher für die Deutsche Armée und Marine.*

FRENCH newspapers and pamphlets have been lately concerning themselves with the spreading of unfavourable reports with regard to the German quick-firing field gun now being introduced, and have run it down while belauding the French gun. According to them the gun, when fired, is unsteady, and therefore requires to be re-laid after each round. The buffer and springs are said to have given so much trouble that we are about to try to replace the present mechanism by recoil gear on the French hydropneumatic system; further, it is said to be possible to fire the gun before the breech is completely closed, and thus the detachment is greatly endangered—and so on. Every one of these reports is altogether chimerical; similar stories can be read in German papers about the French gun. A detailed comparison of both guns, therefore, seems requisite. In consideration, however, of the immense weight which modern artillery must throw into the scale in any decisive battle, any comparison must not be confined merely to the actual *matériel*, but must include the effect of fire, organisation, employment, and training, for thus only can a satisfactory idea of the value of the weapon really be obtained.

The Matériel.

A general acquaintance with the *matériel* is taken for granted. If anybody should wish to know more about it, let him turn to my papers, "The French Field Artillery," "Studies of the Quick-Firing Guns with Barrel Recoil," and Captain Wernigk's book, "Field Artillery *Matériel*, c/96."

The methods of closing the breech—with the French gun a screw, with the German the Krupp-Leitwell wedge—fulfil all that is claimed for them. The working is simple; with either gun a premature discharge or opening of the breech on the march is guarded against.

The main difference between the two guns lies in the buffer and the running-up gear. In both equipments the recoil of the barrel is retarded by a hydraulic buffer, and this retardation is increased or strengthened in the French gun by compressed air, in the German gun by a strong spring. The recoil of the barrel exerts great pressure on the compressed air (or spring), which again expands as soon as

the energy of the recoil is exhausted and returns the gun to the same position as before discharge. The German arrangement is far the less delicate of the two. The weakness of both lies in the stuffing-boxes, which prevent the escape of the buffer-liquids. The French gun has four of these, which have not only to prevent the leakage of the buffer-liquid, but also any escape of air; the German gun has but one stuffing-box, which merely has to ensure the retention of the buffer-liquid. Leakage of liquid is not a matter of much importance, as many experiments have proved; on the other hand, if the stuffing-boxes of the French gun were not air and water-tight under a strong pressure (of 12 atmospheres), a rapid escape of air would result and prevent the gun returning to the firing position. The breakage of a running-up spring should not easily occur, and is not of any particular importance; at any rate, this has not been noticed during a long course of firing, carried out with a purposely broken spring. In all probability this very insensitiveness is one of the chief reasons why all the Powers, except Portugal, which have tried both French and German guns, have decided in favour of the German weapon. I will here by no means state that the French brake arrangement is not well adapted for field service. In the China Expedition, where there was certainly no serious fighting, but where there were trying marches over bad ground, the French gun did very well This, however, does not alter the fact that the German weapon arouses a feeling of greater confidence.

Another important difference between the two guns lies in the elevating gear. With the French gun the cradle rests in an intermediate carriage, or saddle, in which it can revolve about a horizontal axis. This saddle also carries the sights, and can itself revolve, on trunnions bedded in the trail brackets, about the same horizontal axis. To direct the line of sight on to the target the saddle is given the necessary rotation about its trunnions; this gives the gun the elevation corresponding to the angle of sight. In order to give the gun the further elevation corresponding to the ranges, its axis must be pointed at a certain angle above the line of sight. To effect this the gun and cradle are elevated, with reference to the saddle, by means of an elevating screw and hand-wheel, until a pointer upon a dial fixed to the saddle marks the required angle.

After firing, the gun-layer has to satisfy himself that the line of sight is maintained on the object; if the range is the same, the gun is correctly layed, since nothing has altered in the position of the cradle in the carrier. If a different range is given, the elevating number merely has to give the necessary motion to his elevating handle until the pointer marks the corresponding division. It is clear that by this means the rate of fire is greatly accelerated, since all re-laying and re-setting of the sights are now done away with when a change of range is given out. To give the correct elevation by a turn of the handle takes no more time than re-laying does now. Unfortunately, the German field gun has not got this arrangement of the independent line of sight, although Krupp has introduced one that is very simple and durable.

If in this respect we must allow an advantage to the French gun, on the other hand the sighting arrangements of the German gun are the more complete; in both guns the long line of sight—back and foresight—is replaced by the short optical line of sight. The French has the so-called "collimateur," the German a short

"telescopic sight." Both admit of rapid and accurate laying, but the telescopic sight gives a sharper, clearer, and larger image than does the "collimateur," which also easily fails to give good results when the light is bad.

Both guns have arrangements for fine lateral laying: with the German gun the barrel can be turned some degrees on a perpendicular axis; with the French weapon the whole carriage can be displaced on its axle, which requires a far greater effort than with the German gun.

One great weakness of the French gun is, that before the first shot can be fired the gun must be anchored, that is to say, the wheels must be prevented from moving sideways by a couple of drag-shoes. When fired the gun and carriage recoils about 40 cm., and thenceforth remains fixed. This anchoring (abatage) is a difficult and minute operation, since the gun must, at the same time, be roughly layed for line; it also takes up time, and the detachment must get out of the way pending the first shot, and thus lose the advantage of the shield. The anchoring also makes any change of direction very difficult, as also the following of an object moving across the front.

In the French gun the shield is in front of, with the German in rear of, the axle. Besides this, the German shields are higher and are continuous over the gun. The gun projects from them as through a loop-hole, whereas with the French gun there is a fairly large gap between the right and left shield. Consequently, the shields of the German gun provide more protection.

The French gun, without limber, has a weight of 1,100 kg.; that of the German gun is about 950 kg.; and the latter is, consequently, far more mobile.

Both guns fire shrapnel and high-explosive shell. The French shrapnel shell weighs 7·24 kg., and contains 300 bullets of 12 grammes; the German weighs 6·85 kg., contains 300 bullets of 10 grammes. Both have identical construction; both have a time and percussion fuse, the French up to 5,500 metres, the German up to 5,000. With the German gun the setting of the fuse for the shrapnel is done by hand, with the French gun by an automatic setting machine, *i.e.*, the machine once set effects the setting of the fuse by turning a handle. Should a length of fuse be required which does not correspond to the range given, the difference is allowed for in the setting of the machine, in the same manner as in the German gun, the slide on the back-sight shows the difference between the elevation ordered and that corresponding to the length of fuse.

The French high-explosive shell is not intended for engaging a concealed objective, but only for the destruction of fixed objectives, and, therefore, has no time but only percussion fuse. In Germany the shell and charge are separate, whereas in France the ammunition is fixed, which is certainly preferable, especially in regard to the simplifying of the service of the gun. The French limber carries only 24, the German 36 rounds. The weight of the French gun in marching order is from 1,800 to 1,860 kg., that of the German about 1,770. But in comparing these weights it must be remembered that the French gun carries three, and the German five gunners, so that including the gunners the weight of the French gun is 2,034 to 2,094, that of the German 2,150 kg. With the German gun the wheelers

pull from swingle-trees, while with the French the traces are attached to the splinter bar by means of spring draught-loops.

The ammunition wagons have the same limbers as the guns. The French wagon contains 72, the German 52 rounds, so that the whole ammunition wagons contain respectively 96 and 98. The French wagon is so arranged that it can be placed tilted up beside the gun; the armoured bottom of the wagon is turned towards the enemy, and the cover is opened like the two doors of a cupboard. The detachment with the ammunition wagon are protected when kneeling against shrapnel and musketry, the open doors give them cover from oblique fire; each ammunition wagon contains a fuse setter.

In Germany the shell and charge are packed four in a basket, while in France preference is given to single packing, where space is better taken advantage of; on the other hand, packing in baskets is preferable when men have to carry the ammunition any distance. No reliable details can be given as to the weight of the French ammunition wagon. Since, however, the ammunition it contains is more than three cwt. heavier than the German, the weight of the whole must be greater.

The Execution.

The muzzle velocity of the French gun is 529, that of the German 465 m.; the "muzzle energy" is, respectively, 104 and 76 metre-tons.

In consequence of its higher muzzle-velocity, and greater sectional density (164 to 147 g.), the French gun has a flatter trajectory and a deeper beaten zone at ranges over 3,000 metres.

The following abbreviated range-table gives approximate values which serve for purposes of comparison:—

Gun.	Range, Metres.	Elevation, Degrees.	Angle of descent. Degrees.	Beaten zone for target 1 metre high.	Velocity.
German	1,000	1 3 *	1 13	32	369
French		1 3	1 6	42	418
German	2,000	3 10	4 12	12	310
French		2 13	3 12	15	340
German	3,000	6 4	8 11	6·5	279
French		4 3	6 2	9·3	306
German	4,000	9 8	13 8	4·2	256
French		7 13	11 10	4·9	274
German	5,000	13 7	19 7	2·8	237
French		11 2	16 11	3·3	250
German	6,000	18 3	26 8	2·0	220
French		15 4	22 8	2·4	234

* The small figures represent sixteenths of a degree.

Both guns have the same number of bullets in the shrapnel, and probably much the same cone of dispersion. If the batteries

are properly ranged, there should be little difference noticeable in the effect produced; if the shrapnel are burst too far short of the target, the French gun will have a certain superiority. With the same height of burst it will have a deeper zone of effect. If both batteries covered an equal space with fire, the effect would roughly be proportionate to the dimensions of the beaten areas.

As regards the rapidity of fire, both guns are pretty equal; the fixed ammunition and the independent sight line of the French gun favour rapid fire (especially in ranging); the German gun is steadier during fire.

The high ballistics of the French gun can only be obtained at the expense of stability. The gun is for this reason less steady than the German one, and requires, as above explained, the elaborate operation of anchoring.

The sum of all this is that, in my opinion, one must give the preference to the German gun, because in action it is more mobile, in opening fire it is handier, and is also less susceptible to the evil influence of bad weather and bad roads, and is, therefore, better suited for active service.

Organisation.

The greatest difference between the rival organisations lies in the fact that a French battery has four, a German six guns. There can be no doubt that the bigger battery has a great advantage over one with fewer guns when both are of equal quality; that is to say that if in both batteries the *personnel* is composed of the same proportion of men serving with the colours and reserve men, if both detachments are equally well trained, if both possess good fire discipline, if in both batteries each gun has the same number of rounds and description of ammunition; the one battery will fire half as many rounds again as the other in the same length of time. If any one of those conditions is not complied with the advantage will become less and less, and may veer round altogether if the battery with fewer guns can outdo the other in firing through better fire discipline and training.

As a matter of fact the smaller battery has the advantage in every way. In peace the French battery has four guns and two ammunition wagons, all horsed (certainly only with four horses), while in Germany all batteries on the lower establishment—and that is not less than 231 out of 574, or about 40 per cent.—can only be equipped with four-horsed guns. French field batteries have a peace establishment of 5 officers, 103 non-commissioned officers and men, and 61 horses. The peace strength of the German batteries varies very much, but the average is not much below that of the French—or about 4 officers, 110 non-commissioned officers and men, and 54 horses. If one adds in all the horses, the numbers would be about the same, the only difference is that one French field battery has four, the German six guns. The German peace strength is also proportionately lower than the French, and the training is, perhaps, equally good in both, since it appears to be possible, on mobilisation, to provide all German guns with proper *nucleus* detachments. On the other hand it is undeniable that the fire-control of a 4-gun battery is easier than in a 6-gun battery, and therefore, the fire discipline can be stricter. The battery commander can supervise the small battery

better and command it by voice. But, most important of all, the French battery is far more generously supplied with ammunition, especially in the fighting line of the battery, to which I shall return later.

The case, then, resolves itself into this: either the German batteries fire deliberate rounds of battery fire, when they do not use all their guns. Numbers 5 and 6 are not required, they are superfluous, even positively harmful, since they take up useless room and make casualties—or else they use rapid fire (firing as fast, or nearly as fast, as the French guns) when they exhaust their ammunition in a very short time. Even when firing deliberately they must begin to think of their ammunition reserves before the French have to; for the German battery has only 264 rounds, the French 432, more than half as many again. But for a battery in action under hostile fire, nothing can well be worse than to run short of ammunition, since a reserve can only be brought up with serious loss.

In the above it is assumed that on the German side all the batteries can be brought into action, and that none are forced to stand aside for want of room. But if the space of deployment is much confined so that the superior number of guns can only be used partially or not at all, they are, of course, of no use at all, and consequently the big batteries are put at a disadvantage. There can be, then, no question that in similar circumstances six batteries of four guns will have a superiority over four batteries of six guns.

In the French Army Corps there are, under normal arrangements, 20 or 23 batteries, in the German Army Corps 24. The French battery has 4 guns, 12 ammunition wagons, and 4 other wagons; the German battery has 6 guns, 6 ammunition wagons, and 5 others. The first has 312 rounds per gun, or a total of 1,248; the German 130 rounds per gun, or 780 in all. But in comparing the two we must not forget the light ammunition column, found only in Germany, by means of which the number of rounds at the disposal of the battery is raised to 1,132, or 188·6 per gun.

In Germany, as is known, the artillery is divided amongst the infantry divisions; each division has a field artillery brigade of two regiments, each of two detachments of three batteries. In half the divisions all twelve are gun batteries; the remaining divisions have nine gun batteries and three howitzer batteries. In nine divisions there are three horse batteries in place of three field batteries.

In France, on the other hand, each infantry division has only 6 batteries; the remainder—6 or 9 field and 2 horse—form the corps artillery, which, therefore, has a strength of 8 or 11 batteries. If the corps artillery has 11, then there are probably 3 howitzer batteries (or, strictly speaking, short 12 c.m. batteries) among them. Nothing is very exactly known about this point, or which army corps have 20 and which 23 batteries.

The greater numerical strength of the German batteries would certainly be a great advantage when we could always be sure of having room to deploy all our guns. An army corps of 25 battalions requires, according to what is to-day laid down for service, a front of from 2 to 3 miles, of which the artillery, with its 24 batteries, requires at least 2,700 yards, or from five-eighths to five-sixths of the whole space. I have before now expressed my fear that we shall not find this room wherein to deploy our artillery, since even in the great battles of 1870-71, the space was restricted, although

there were then only 84 or 90 guns to an army corps. It will be different, of course, if one believes that the length of front will be increased owing to the greater fire effect. With a front of 5 or 6 miles, one need not, of course, consider the question of want of deploying room.

There, then, only remains the necessity of increasing the ammunition supply with the batteries. It is, above all, important in the artillery-fight to be the first to secure fire effect. With quick-firers one must content oneself more than ever with rough ranging, in order, as soon as possible, to secure fire effect, which can only consist in covering a space of great depth, and is obtained in a short time, but not without great expenditure of ammunition. Anyone who restricts himself to exactness in ranging, in order to economise ammunition, will soon find out that this is very much more difficult to attain than in peace, and that it is quite impossible to carry out if the enemy is overwhelming us with rapid fire. One must proceed in just this way against the other arms; the short time during which they are exposed must be made every use of, else they disappear rapidly behind cover. The necessity for a much larger ammunition supply cannot be denied. The batteries—better still, the guns—must be at least as well supplied as the French. For the first we should require an increase of 32 ammunition wagons for each army corps, for the latter of about 200.

It may here be remarked that in France more people are now calling out—General Langlois is no longer the only one—for a considerable increase in the ammunition supply, as that now sanctioned is insufficient. Each French gun has available in the battery 312 rounds, in the army corps ammunition park over 189·3. The provision of divisional ammunition parks is now demanded (similar to our light ammunition columns) to carry 200 rounds per gun, so that, then, there will be 700 rounds per gun available in the army corps.[1]

The grounds upon which Germany, in 1899, gave up corps artillery, and divided the whole artillery among the infantry divisions are too well known to be here repeated. It is enough here to allude to it, that the idea underlying the creation of corps artillery had never, or very seldom, been realised. In the great battles of 1870-71, there seemed to be no difference in the employment of divisional and corps artillery.

It is a disadvantage when the two divisions of a corps are supplied with different guns (one with 12 field batteries, the other with 9 field and 3 howitzer batteries), since it can never be known beforehand when and where howitzers are to be employed. If howitzers are considered necessary, then it is better either to equip

[1] It is certain that the ammunition expenditure in future wars will be extraordinarily high. Although much that has reached us on this subject from the Far East may be exaggerated, still, there is good authority for a great deal. According to a lecture given before the St. Petersburg Military Society, the 8 batteries of the East Siberian Rifles Artillery Brigade at Taschikiao, fired 1,992 rounds, or 249 per gun; the 1st and 2nd Batteries of the 9th East Siberian Rifles Cavalry Brigade fired 10,000 rounds in the two days' fighting at Liao-Yang, on the 30th and 31st August, or 628 rounds per gun. Then, too, the guns used were not really quick-firers, and neither side used shielded guns, by the use of which the artillery combat is lengthened.

both divisions with them equally, or else to place them at the disposal of the G.O.C., as is done in France. When the Corps Artillery has three field detachments, one of them is always made up of 3 short 12 c.m. batteries. But certainly every corps has not got these short-gun batteries.

Each French army corps has two horse artillery batteries in its corps artillery; it is considered that these can be brought up to any threatened point on the battle line more quickly than can field batteries—the battle of Beaune La Rolande, where Körber's two horse batteries again restored the fight, forms a classic example. The idea is certainly correct; but it starts on the assumption that all corps are equipped equally, as is the case in France. It is different in Germany, where only 9 out of the 46 divisions have horse artillery batteries. If 37 divisions have to content themselves with no horse batteries, the other nine must do without them too. It would be consistent either to give all divisions horse artillery, or to change the 27 horse batteries of the infantry divisions into field artillery. I would prefer the latter, especially as thus 33 batteries on the lower establishment might be brought up to the medium establishment.

The distribution of the artillery among the divisions, as is done in Germany, obliges the higher commanders to make themselves acquainted in peace with the employment of this arm, which they must command in war, and only when they have learnt this can they use it to the best advantage. This is the one great advantage of this organisation, which outweighs all the accompanying disadvantages. In France, too, this has not been overlooked, and the batteries intended on service for the divisional artillery are placed under the orders of the divisional commander. These batteries are also under the O.C.R.A., who commands the whole artillery of the army corps in so far as purely artillery matters are concerned. They have, therefore, to serve two masters. But the artillery general is certainly in no enviable position, since he has to supervise the training of these batteries carried out—not according to his own views—but according to those of the two divisional commanders. The French see very well that this must lead to impossible situations, and make fun in the comic papers of the unhappy general, who has to look out in one division for tight coats and roomy breeches, and in the other for tight breeches and loose coats, and who confuses the two together. Recently a change is said to have been made, and the divisional commanders are to be permanent inspectors of their artillery. Perhaps they have been given a knife without either blade or handle.[1]

The Employment.

The French regulations are based upon the idea that modern artillery is characterised by the rapidity of its fire-effect, due to the

[1] Since the above was in print the text of the Minister's decree has appeared, wherein the duties of the divisional commander are defined. According to this he has to superintend the mobilisation work and the training of the regiments of his division, the training, however, only in so far as concerns their efficient working with the other arms—the tactical training therefore. He can give his own instructions for any matter that seems to him to be necessary. Proposals for promotions, appointments, etc., are laid before higher authority through him.

two most important properties of its *matériel*—the great speed of firing and the effect of the charge, as well as the possibility of taking the enemy by surprise. The element of surprise depends upon the preliminary preparations for opening fire being conducted under cover, which must be done whenever the ground admits, so that the artillery first betrays its presence when its entry into action has become imperative. The artillery will, therefore, employ sudden, sharp, and heavy bursts of fire (rafales), by means of which the freedom of action is taken out of the hands of the enemy, and the capture by the other arms of fire positions, whose possession is necessary for success, is made easier. Firing will, therefore, invariably be interrupted by long pauses.

The leading principle of the French regulations, wherein they differ widely from the German, is the rule that the greatest possible number of batteries is always to be held in readiness, but that, at the opening of an action, only so many are to be made use of as may be required to obtain the required effect. The number of these batteries depends less upon the objective to be engaged than on the extent of the area to be covered by fire. All batteries, which are not intended to open fire at once, are held in readiness, so that without loss of time they can open an effective fire either against a fresh target and against an objective not engaged sufficiently heavily.

The German regulations do not hold with keeping guns back in readiness, but lay stress on the early development of an overpowering artillery, so as from the very first to gain the superior fire effect. This answers more to the natural human instinct; when a unit reaches the battle-field, the natural wish is to hurry so as to assist hard-pressed comrades by engaging the objective in sight. Another question is whether it is well to give way to this instinct. If an area of 200 metres can be satisfactorily covered by the fire of one battery, it is questionable whether it is right to drag 3 or 4 batteries into action, because there is more than one battery in sight. Certainly 3 batteries can do more than one, but only when they are properly ranged; it is, however, questionable, and proved by experience, that ranging against a small target is easier for one battery than for 3 or more firing together, because the shots are then much less easily distinguished.

Batteries can either be held ready to open fire, when the course of the action shows that suitable objectives will soon present themselves, or they can be kept limbered up in the vicinity of the spot where they are expected to come into action. In both cases careful preparation is made for opening fire—such as by careful examination and scrutiny of the ground in front, so as to recognise places where targets may hereafter present themselves; they select aiming points, compare them with distant points already noted, take ranges, etc., in short, batteries must make all preliminary arrangements, so that they may overpower their objective directly it is pointed out to them; at any rate, all this can be done better than when already in action against one target, and are required to change to a fresh one. The main point here is not prematurely to disclose their presence, otherwise batteries seeking to open an overpowering fire may themselves be overpowered.

Concerned with this, too, is the preference for wholly or partially concealed positions; the French regulations attach great importance to their batteries being invisible to the enemy except

through the flash of the discharge. That does not, however, prevent the target being seen by the layer standing behind the gun, and the aim being taken. Where the *terrain* demands it, all idea of cover is given up, and the regulations lay down that in the choice of a fire position all technical objections fall through when an immediate opening of fire is necessary, and when it is a question of supporting infantry.

These regulations are much the same as the German, only we do not lay them down quite so precisely.

There is a great difference in the arrangement of the battery in action and of the fire position. The fighting line of the French battery consists of 4 guns and 6 wagons. Each gun with its wagon forms one inseparable unit. In the fire position immediately to the left of the gun, there is an up-ended wagon limber, so that the whole gun-detachment—1 gun-commander and 6 gunners are for the most part shielded from musketry and shrapnel-fire. The section commander, too, can stand behind an ammunition wagon. The up-ended wagon limber of the fifth ammunition wagon is placed at an interval of 15 metres on one flank of the battery, and affords a covered observation post to the battery commander and his staff; the sixth ammunition wagon limber is placed behind the other flank, and gives cover to the battery artificers.

The German fighting line of a battery is composed of 6 guns and 3 wagons, of which one stands behind each section in the fire position. Whereas, in the French artillery each gun has $1\frac{1}{2}$ ammunition wagons, the Germans have only half a wagon per gun, or one-third as much as the French. Since the German wagon holds 88, the French 96 rounds, the proportion of rounds available is as 1 to $3\frac{1}{4}$, therefore, very unfavourable for us.[1] With the German guns the ammunition servers are not under cover, nor are the wagons armoured. When it is possible to unlimber under cover, to unload the ammunition unhindered and bring it up to the guns, so that the ammunition servers have not to run backwards and forwards under fire—then only can the German batteries commence a duel with the French guns with good results. The German guns are obliged to attach far greater importance than in France to coming into action without exposing themselves. One must, too, not forget that unloading all the ammunition hinders greatly any change of position.

It is to be hoped that this arrangement of the battery fighting line is only provisional, until the ammunition limbers are supplied with shields, and each gun with an ammunition wagon. There will then appear a fresh evil—in the size of the fighting line of the battery—6 guns and 6 ammunition wagons. Such a body will form a most unwieldy tactical unit, especially since it frequently happens that less than one quarter the number of horses required are available.

Methods of Fire.

The manner of firing used by the French is rapid fire; that is to say, after ranging, each gun, as soon as it is ready, expends a

[1] The proportion will be less unfavourable in the fire position if, in the German batteries, not only the ammunition wagon bodies, but the entire wagons are left in the position; the proportion, then, would be 1 to 1·62.

certain pre-arranged number of rounds with the same or corrected aim. The elevation or direction, or both, can be altered. In order to gain effect the first, it is, as a rule, enough to get a long bracket (generally 200 metres, but under difficult conditions even longer), and to cover with shell the space between the limits of the bracket, and also, in order to be certain of effect, the space for some distance short of it. Only when the situation allows it—for example, if the opponent has already been overpowered—is a shorter bracket made use of. Against a live target time fuse is generally used, and the guns are fired at 2—3 second intervals from flank to flank—what the French call *salve*. Ranging can be, and frequently is done with one gun only.

It is not known what the German firing regulations will be after re-armament. We may be certain that they will not be like the French, since with a six-gun battery weakly supplied with ammunition that may be taken for granted. Ranging will probably be done by one or two guns with percussion fuse, and after changing to time-fuse, in order to come to a decision in regard to height of burst, a heavy fire will then be commenced. A comparison of the two systems is impossible, so long as no reliable practice reports, with detailed statements of time and effect, are to be come by.

Training and Instruction.

The method of instruction in Germany differs essentially from the French—to the great advantage of the former—in that in Germany a far greater independence is allowed to the batteries. For centuries France has been the home of centralisation. Herein lie the seeds of her progress, but also of the great catastrophes which twice have overtaken that country in the last century. Latterly, there seems to be an inclination to encourage initiative in the Army; at any rate, the Infantry Training Regulations, and, still more, the Musketry Regulations, give the company commanders great latitude if not, indeed, absolute freedom. The battery commander also is not tied down by his firing regulations; they allow him perfect freedom in the choice of methods of fire, and lay down no petty restrictions.

In regard to individual training there can hardly be a greater difference than is here shown; they are first noticeable when the battery is exercised in the field. We lay great stress on strict discipline, whereby the soldier is not only formed but his training is carried out where it can best be done—or, strictly speaking, only where it can be done—in his battery, where he is always under the eyes of his own officers. In France the greatest attention is paid to the training of officers and of leaders of units at war strength. While in Germany, the battery always manœuvres with its peace establishment, either alone or in its brigade, the rule in France is to form batteries often at war strength, for drill purposes, out of several different units. There are, too, in Germany officers who clamour for the French system; Lieut.-General von Reichenaû, in his book, which appeared in 1895, on the "War Training of Field Artillery," broke a lance in favour of the system. Against this it was rightly maintained that by this means the discipline of the troops must suffer if they drilled constantly under strange officers, and more important still, that officers, and especially battery commanders,

would lose all pride and pleasure in their work if they could no longer be responsible for the good state of their commands. In my opinion, it were best to choose a middle path, and carry out the training entirely in the Regular units, while for manœuvre—and especially in the great autumn manœuvres—to form units at war strength oftener than has hitherto been done.

Formerly it was said of the French Army that its horsemanship was of a very low order; that, however, is now quite changed; cross-country riding and long-distance riding, have been greatly practised. The same may be said of the field artillery. The training in riding of the officers, is no longer confined to the riding school, but the regulations expressly enjoin that instruction should include the training of horses, and the riding of long distances across country. In the great long distance rides, carried out annually on rational lines, the field artillery officers also take part in large numbers and with good results.

The French gunner must also be trained in the use of the carbine, because the detachments are armed with it. Whether that is practical or not is a matter upon which German opinion is greatly divided. Personally, I do not look upon it as a good thing thus to arm the gunners, who should hold that their own guns are their best weapons. On the other hand, I am in favour of allowing so many rifles per battery as are required for general duties. As is well known, the men of our ammunition columns are armed with rifles, but as none of them receive any instruction whatever in their use, they are of very questionable value.

In the above only the French 95 gun has been considered—that with which all field batteries as well as all the horse batteries of the corps artillery are armed. The horse batteries of the cavalry divisions are provisionally armed; still, with the old 80 gun, because the 90 gun is too heavy, and because the "anchoring" precludes its employment against targets moving across the front. This gun fires shrapnel of 6·3 kg., giving splinters of about 163 pieces, and shell with a muzzle velocity of 1,600 f.s. The gun weighs 955 kg., without limber, and 1,600 kg. with limber. The batteries have 6 guns. In the event of the proposed re-armament with a gun-recoil equipment—regarding the construction of which nothing is known—the batteries will certainly only have 4 guns; probably then, however, the cavalry division will have 3 instead of as at present, only 2.

In place of a light field howitzer, the French have a short 12 cm. gun. This gun has high ballistics and great shell-power. It fires shrapnel and shell of 20 kg., with a maximum muzzle velocity of 910 f.s., the shrapnel contains 637 bullets, the H.E. shell contains 4 kg. of high explosive. The light German field howitzer fires shrapnel weighing only 12·8 kg., with 500 bullets, and shell of 15·7 kg. weight with 1·5 kg. of explosive; muzzle velocity, 1,072 and 955 f.s., respectively. The great shell-power has to be bought by the French with great weight of gun, which weighs nearly half as much again as the German. The 120 mm. gun is not intended, like the German field howitzer, to be used in the first line against targets under cover, but for the destruction of inanimate objectives; the shell has, consequently, a percussion fuse. When engaging targets under cover, shrapnel with reduced charges are employed, from which not much can be expected. The French themselves are not satisfied

with this gun; it is to be replaced with a lighter gun, about which nothing definite is known.

Conclusions.

So far as the *matériel* is concerned, the German artillery, after the alterations in the 96 gun, will be in no way behind the French, if only the ammunition limbers are shielded in the same manner. The French, however, have the advantage of having had longer to become familiarised with their *matériel*, and have been able to draw full value from the new armament. I altogether prefer the smaller French batteries, because this organisation alone permits of the sufficient ammunition supply. The distribution of the whole field artillery among the infantry divisions, and the abandonment of the corps artillery, is a great advantage to the German artillery. The methods of firing, and the rules for the employment of artillery are not finally decided upon yet in Germany; there is much wherein the French regulations differ from ours that is worthy of consideration, and which will, no doubt, receive attention. It is to be hoped that the new regulations will soon be published, so that officers and men may make themselves acquainted with them as soon as possible.

SUBMARINE TELEGRAPHY.

By CHARLES BRIGHT, F.R.S.E., M.I.E.E.

On Wednesday, 17th April, 1907.
Commander W. F. CABORNE, C.B., R.N.R., in the Chair.

The following Lecture was delivered in a popular form. It was profusely illustrated by means of Lantern Slides, specimens and working models; but it has only been found possible to reproduce a certain number of the first named.

"The wrecks dissolve above us; their dust drops down from afar—
Down to the dark, to the utter dark, where blind sea-snakes are.
There is no sound, no echo of sound, in the deserts of the deep,
On the great grey level plains of ooze, where the shell-burred cables creep.
Here in the womb of the world—here on the tie-ribs of earth—
Words, and the words of men, flicker and flutter and beat."

—*Rudyard Kipling*

WITHIN the confines of a single lecture I cannot profess to cover anything like the entire ground of my subject. All I can attempt to do is to touch lightly on the main features that are perhaps most likely to interest my audience. Even then, some of you will, no doubt, discover how much I have omitted to deal with.

If, here in Whitehall, you wished to communicate by cable to, say, Bombay, you would only require to go to the nearest Post Office. A good deal has, however, to be done by others to enable your message to be electrically transmitted. It is this that I am here to tell you about, rather than to discuss the abstract question as to whether we are any the better, or happier, for our widespread system of telegraphy.

My subject, in itself, covers considerably more ground than would be supposed at first sight. It might well be thought that the art of telegraphing under the sea was a subject that was confined to the electrical methods adopted for carrying on communication; but before establishing our communication, we must make and lay our cable, to convey the electric current. I, therefore, propose to first present to you a general idea of the theory and practice of transmitting electric signals such as go to form messages.

I shall, thus, be starting with the heaviest part of my subject first, and—if you will allow me—I shall hope to end up with light allusions to lantern slides depicting some of the various historical experiences connected with submarine telegraphy, besides views of telegraph stations in different quarters of the globe, and portraits of the early pioneers to whom we are indebted for our telegraph cable system.

ELECTRIC SIGNALLING.

Before proceeding, however, it may be well to say a few words on early methods of signalling followed by certain references to electricity and electric telegraphy in general; and here I am compelled to strike a mean between concluding that my audience knows nothing about electricity, and concluding that you are all thoroughly conversant with its mysteries. As a matter of fact, we none of us know much about it at present—very little about its nature at any rate—but no doubt many of you know as much as I do.

The desire for communicating with our fellow beings at a distance received considerable encouragement from the early discoveries in electrical phenomena, which—together with the invention of the voltaic cell—gradually led to a practical electric telegraph.

The principle of all telegraph instruments is dependent upon the telegraph alphabet introduced by Professor Morse for the purpose, where different letters are represented by different combinations of short and long periods — whether in the form of sound clicks, as in the "Sounder," or in that of ink marks on paper, as in the Morse Recorder.

The simplicity and economy of the Sounder and such-like for village telegraph offices, and the reliability of the Morse Recorder and such-like for more important "circuits," have been sufficient to maintain the use of the apparatus I have described, except where greater speeds are a special requirement. The objection to this system is, however, the long—in contra-distinction to the short—periods which go to form the alphabet. This is comparatively immaterial for the bare iron wires supported on porcelain insulators which constitute our ordinary overland telegraphs. But where the conditions demand insulated wires—whether overhead, underground, or submarine—it is desirable to achieve a greater speed of working than is possible by this system; and the method adopted is to substitute the long periods by a current in the reverse direction.

The actual apparatus now in use for signalling through submarine cables I shall be describing shortly. Meantime, I would remind you that there are, so to speak, various sorts of electricity. For instance, no doubt some of you are familiar with the sparks and smacks that can be produced from a frictional machine. Others of you will know what a bad time anyone may have if he handles two bare wires which form part of the same circuit conveying a high pressure current, whether for lighting, traction, or power purposes. But in telegraphy—the work to be done being of so delicate an order—we have nothing to do with electricity of the killing kind; and perhaps you will believe me when I tell you that by way of demonstrating the efficiency of one of the earliest Atlantic cables, just after its successful completion, a message was actually sent through, by a battery consisting of a silver thimble containing a morsel of zinc, weighing a grain, and a few drops of sulphuric acid.

In ordinary practice we very generally employ a few Leclanché or other voltaic cells, the number varying from 5 to 100, according to the length, type, and condition of the line. Accumulators are also much used, and so are dry cells.

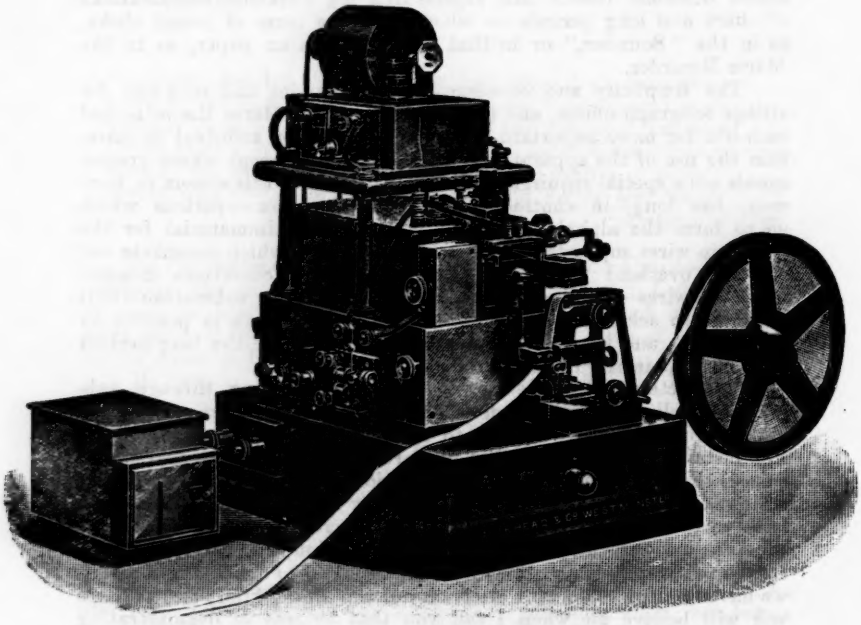
When a current of electricity is passed through a cable by connection with a battery of the description I have named, the insulated conductor, having a certain electrical resistance (the inverse

of conductivity) and a certain electro-static capacity—that function of any Leyden jar system which determines its capacity for electric charge in a given time—what is known as electric retardation takes place. This tends to check the complete charging or discharging of a cable spontaneously.

Having endeavoured to present to you an idea of the general principles of electric signalling through cables, I will now turn to a consideration of the apparatus employed in practice.

In the year 1867, the then Sir William Thomson (afterwards Lord Kelvin) introduced what is known as the Siphon Recorder for receiving signals through more or less long lengths of cable, and this is now in general use, one of its main advantages over previous apparatus being that it supplies a record of the signals as received.

A recent pattern of this instrument—due to Dr. Alexander Muirhead—you have before you here.



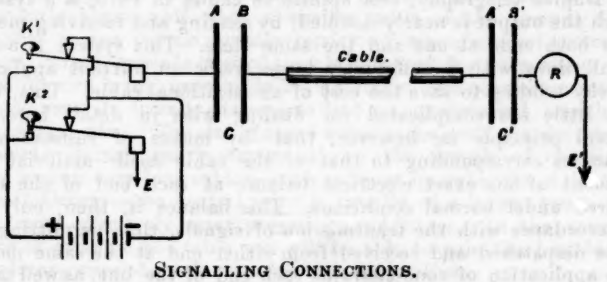
THE SIPHON RECORDER.

It consists of a light coil of wire vertically suspended in the field of a permanent steel magnet.

Attached to the coil is a light glass siphon, one end of which dips into an ink vessel, the other hanging over a continuous strip of paper drawn along by an electric motor. Thus, every deflection of the suspended coil, actuated by a current passing through it, is recorded by a horizontal ink line of certain direction and length across the slip.

Some of you may naturally wonder why the coil should deflect when a current passes through it. To this I can only reply that it

does so, as surely as the magnetic needle of a compass—or of a needle telegraph instrument—does, when under the influence of an electric current. There is no really complete explanation of such electrical phenomena, and it is impossible to go into the matter in further detail this afternoon.

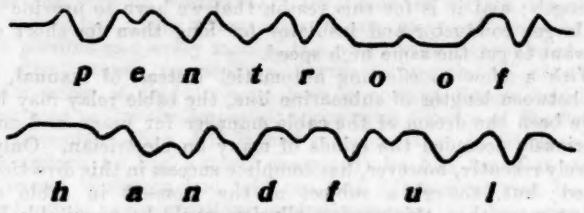


SIGNALLING CONNECTIONS.

At the transmitting end, the current is conveyed into the cable by manipulating a key of the type shown here, which, by the depression of one or other of the tapping-levers, connects one or other pole of the battery with the end of the cable, thereby sending a current in one direction or the other—or, to put it in another way, sending either a positive or negative current as the case may be—the result being a deflection of the suspended coil at the other end in one direction or the other.

I should, perhaps, mention that the same result could be achieved in a primitive manner by touching the bare end of the conductor with one pole of the battery or the other, the only use for the key being to effect this object more readily and speedily.

The rapid manipulation of these keys has become such a fine art that a speed of some 35 words a minute can be attained successfully by experienced operators.



SIPHON RECORDER SIGNALS.

With this system, the Morse alphabet is turned to account, as shown here. It might naturally be supposed that great difficulty would be experienced in deciphering such a language. Skilled clerks, however, can make out almost anything in these snake-like movements.

Increased accuracy and speed are further secured nowadays by automatic machine transmission apparatus on the same principle as is in vogue for the despatch of Press news on land telegraphy—the tape at the receiving end of the line being distributed amongst various clerks.

Here before you is the automatic transmitter, but I do not propose to deal with this further to-day, though you can see it working afterwards. It suffices to say that the message is first mechanically punched out on tape, which is then run through a clock-worked automatic transmitting apparatus.

Duplex telegraphy, first applied to cables in 1870, is a system in which the output is nearly doubled, by sending and receiving messages from both ends at one and the same time. This system is adopted on all lines with a sufficiently large traffic to warrant application, thereby tending to save the cost of an additional cable. This, again, is a little too complicated for dealing with in detail here. The general principle is, however, that—by means of resistances and capacities corresponding to that of the cable itself—artificial establishment of an exact electrical balance at each end of the line is secured under normal conditions. This balance is, then, only upset in accordance with the transmission of signals, thus permitting these to be despatched and received from either end at the same moment. The application of condensers at each end of the line, as well as other methods for curbing the current, also tend towards increased speed and greater clearness of signals. Thus, an Atlantic cable of to-day designed to give a speed of 50 words per minute, will practically work at a speed of 100 words a minute on the duplex system in conjunction with automatic machine transmission.

Even the most proficient clerk can scarcely manipulate the transmitting key at a higher rate than 35 words to the minute; but the automatic transmitter is capable of any speed practically; and the receiving apparatus is nowadays almost limitless in its capacity. So much so, that it is really only the line itself which governs the speed on an important ocean cable; and the electrical proportions of this can—within certain limits—be made practically anything in accordance with what the traffic warrants. Thus, it will be seen that wireless telegraphy has something to compete with in the way of output. It should here be added that the working speed of a cable is dependent on its length. It is, in fact, inversely proportional to the square of that length; and it is for this reason that we have to provide a very much larger conductor and insulator for long than for short cables, if we want to get the same high speed.

With a view to effecting automatic, instead of manual, translation between lengths of submarine line, the cable relay may be said to have been the dream of the cable manager for years, and one that has seriously occupied the minds of many an electrician. Only comparatively recently, however, has complete success in this direction been achieved; but, though a subject of the moment in cable circles, anything more than this passing allusion would be unsuitable here.

The practical effect of submarine telegraphy is further achieved by the code and cypher system, whereby a number of words are represented, in secrecy, by a single word or a combination of figures. To take an example, the word "Elgin" in a certain mercantile code stands for as much as "Every article is of good quality that we have shipped to you."

CONSTRUCTION OF THE CABLE.

Having given you some idea of the principle of electro-telegraphy as applied to submarine cables, I will now pass on to the cable itself and its various constituent parts as manufactured.

The Conductor.

Let us first deal with the all-important conductor. On account of its marked superiority, electrically to all metals except silver, which is too expensive, the wire used here has always been composed of the purest possible copper. The first Atlantic cable had a conductivity only about half what a similar cable of the present day boasts; this is due to the greater purity of manufactured copper, which now, indeed, exceeds that of the old standard for pure copper.

A solid wire being unsuitable mechanically, the conductor takes the form of several—usually six—wires laid up, or stranded, together round a central wire. The size of these wires varies with the electrical requirements, being mainly dependent on the length of the line required; and in very long cables—such as those spanning the Atlantic and Pacific Oceans—the central wire is usually of a larger gauge in order to more effectively meet prevailing conditions. In the actual specimens of cable on the table you will be able to gain the best idea of the ordinary sizes of conductors for the various lines.

I will only add here that the machine for laying up the individual wires in the form of a strand is of the rope-making pattern.

The Insulator.

Water—and especially salt water—being a good conductor of electricity, the copper conductor requires to be covered with some substance which is a bad conducting, or insulating, medium, to prevent the transmitted current returning the shortest way to earth instead of going to the further end of the line; and the history of submarine telegraphy may, for practical purposes, be said to have started with the introduction of a suitable insulator. Previously, a number of substances—including tarred cotton, glass tubes steeped in pitch, etc.—had been experimented with for underground wires as well as for subaqueous conductors across canals and rivers.

In the case of a landline, insulation is effected more or less easily by supporting the wire on earthenware insulators at certain intervals; but with a wire laid under water, no such easy means of confining the current is possible and every inch of the wire has to be insulated.

The first person to send a current through an insulated wire under water is said to have been a certain Baron Schilling. In a paper read before the Imperial Academy of Science at St. Petersburg, in December, 1859, Dr. Hamel mentions that in Sömmering's note-book (which he had himself examined) he had found it stated that a General Wolzogen had told the said Sömmering that he had seen an individual named Schilling explode mines in 1812 by a wire laid under the Neva. This, you will agree with me, sounds rather like the information Sam Weller gave at the trial of "Pickwick"; and whether it be correct or not, it is quite certain that Colonel Pasley of the Royal Engineers, at Chatham, sent a current through a wire under the Medway; and that he also blew up the wreck of the "Royal George" at Spithead in 1838, with a wire insulated with tarred rope and covered with an outer layer of pitched yarn.

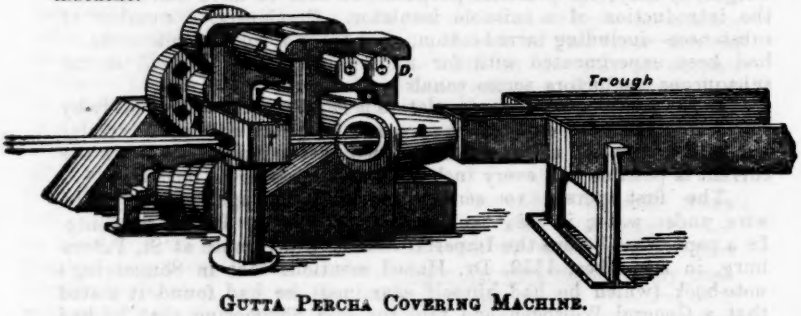
Then Professor Wheatstone (afterwards Sir Charles Wheatstone)—originally a music-seller—is said to have been actually engaged for three years, from 1837 to 1840, on a method of insulation for a proposed cable across the Straits of Dover! In the latter year,

however, Faraday and Werner Siemens independently pointed to the insulating properties of gutta percha; and india rubber was suggested as an electrical insulator about the same time.

To Morse we must certainly give the credit for first using a wire covered with the latter material for transmitting signals under water. At this time, the great American inventor was suffering from most dire poverty; and we find him writing:—"I am crushed for want of means. My hat is hoary with age, and my stockings all want to see my mother." Nevertheless, he succeeded in proving the utility of india rubber covered wire for signalling across rivers.

Gutta percha is the natural product, as a gum or milky juice, which oozes from certain sapotaceous, wild-growing, East Indian trees when an incision is made in the bark. India rubber is the only other substance which has been used in practice for insulating submarine conductors. Its gum is collected in the same way from a somewhat similar tree, growing in the same sort of damp, tropical climates.

Owing largely to the greater difficulty in satisfactory mechanical manipulation—though much used for underground work, for which gutta percha is unsuited—india rubber is comparatively little employed for covering submarine wires, except under special circumstances to be referred to later. Let us return, then, to gutta percha. Being sold by weight, the noble, but enterprising savage is prone to incorporate with it all sorts of impurities—including stones, and even pieces of iron, as "make-weights." Thus, on arriving in this country in solid, but irregular, lumps, the first experience the "gutta" has is that of taking a bath—in the form of a series of purifying, or cleansing processes, accompanied by what is termed "mastication," which consist mainly of a thorough kneading by a sort of devilling machine.



GUTTA PERCHA COVERING MACHINE.

One of the most successful forms of apparatus for applying the so purified gutta percha to the conducting wire is on the same principle as a macaroni machine. No doubt many of you have consumed macaroni without knowing how it is made. The view here illustrates the gutta percha variety. The gum, placed between the tops of the two rollers DD, is drawn down between them in the form of a thin sheet, to be afterwards forced along to the die by means of an archimedean screw, A. With this machine, several wires may be covered at once.

They are hauled off their respective hanks through a die-box, B, containing a sufficient number of dies of a diameter in accordance

with the thickness of the coating required, and thence through a long trough of intensely cold water, to ensure the gutta becoming thoroughly hard before it reaches the collecting drum, which takes from 1 to 3 miles. The thickness of the insulating cover depends upon the length of the line for securing the desired electrical results as to speed of signalling.

I have a specimen here, in my hand, of the "core"—as the covered wire is termed—of the latest Atlantic and Pacific cables. It is the largest type of telegraph core so far used in practice.

The covering of the conductor with suitable insulation is, perhaps, the most important feature in the construction of a submarine telegraph, for so much depends on it; moreover, the cost of the insulating material forms the largest, as well as the most variable, item in the entire line.

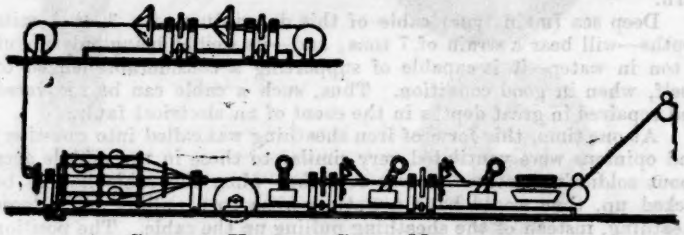
Mechanical Protection.

Once the conducting wire is satisfactorily insulated, nothing else would be required but for the necessity for mechanical protection at the sea bottom, and also to meet the requirements for subsequent recovery when repairs are found to be necessary.

The mechanical protection and strength of a submarine telegraph has—more or less from the start—taken the form of a close sheathing of galvanised iron wires similar to pit ropes. It was at once recognised, however, that if these wires were applied direct on the outside of the core, the insulation would be likely to suffer mechanically, and, therefore, the line would soon become electrically unsound. To meet this objection, the core is enveloped in a close packing of several jute yarns. These are applied by a machine on the same principle as that for laying up the copper strands.

As in the case of the conductor and the jute (or hemp) serving, the iron wires are applied helically in accordance with mechanical requirements, by a machine of precisely the same character as that employed for laying up wire ropes.

For the deep sea portion of a line the wires are nowadays usually composed of steel—with a breaking strain over 100 tons per square inch—the object being longitudinal strength, whereas that for the heavy shore end types is composed of soft iron, but of a much larger gauge for the purposes of weight (combined with flexibility), in



General View of Cable Manufacture.

order to cope with anchors, rocks, tides, etc. The galvanising of iron wires is not a complete preservative against rust in salt water; and, mainly for this reason, the sheathing is coated with a mixture of mineral pitch, tar, and silica—known as Bright and Clark's Com-

pound—which is again applied after the cable has been enveloped in an outer serving of hemp, or canvas tape, by way of a firm binding and a further preservative.

The slide before you presents a general view of the serving and sheathing of a cable in all its operations. Here, on the upper floor of the factory, is the drum of insulated conductor, and here are two jute serving machines for applying yarns, each in opposite directions. Here, on the floor below, is the iron sheathing machine. Here, too, are different machines for applying the compound, cold first, then a layer of canvas tape, then hot compound, then another layer of tape with the reverse lay, then hot compound again, the cable finally passing under streams of cold water to cool and harden the surface before it is led to the cable storage tank, on its way to which it receives a coating of whitewash to prevent sticking.

The splicing together of different lengths of the cable is performed in the same way as ordinary hempen or iron ropes; and it is, in any case, impossible to enter upon the details of this, just as it has also been impossible to deal with the important operation of making a joint in the insulated conductor, the secret of which is care, cleanliness, and experience.

During the whole course of manufacture, the cable is kept under a continuous electrical test; and I can only add that the instruments employed therein are similar in principle to those used in the subsequent electrical working of the line.

About 35 miles is an average output of cable made at a cable factory in an ordinary working day—varying, however, with the number of machines available. Thus, as a rule, it takes from 2 to 3 months to make an Atlantic cable.

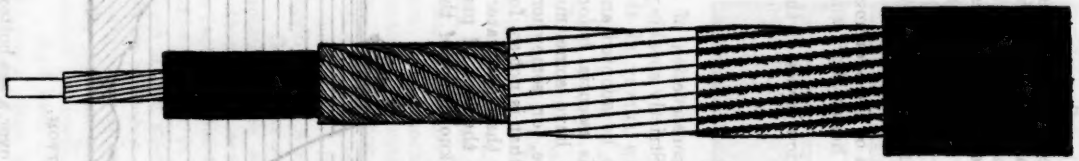
The slide before you (see p. 377) represents the different types of cable of one of the modern Atlantic lines. As you will observe, the shore end types have a second (outer) sheathing of wires. In the case of the Irish shore end, these outer wires appear elliptical. In reality, however, they are the ordinary circular wires, but being applied with a very short lay, this appearance is produced in true section.

The copper conductor is shown here, and surrounding it is the gutta percha insulator, then the jute packing, followed by the sheathing wires varying in each type, as regards their size and number according to conditions, and then the outer covering of compounded yarn.

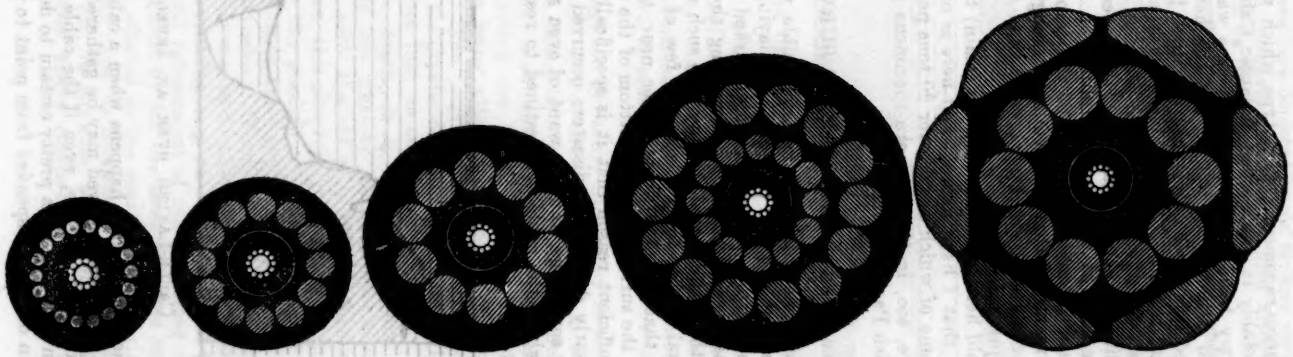
Deep sea (main type) cable of this description—for 3 or 4 mile depths—will bear a strain of 7 tons; and—its weight being only about 1 ton in water—it is capable of supporting a considerable length of itself, when in good condition. Thus, such a cable can be recovered and repaired in great depths in the event of an electrical fault.

At one time, this form of iron sheathing was called into question; and opinions were ventilated very similar to those in the middle ages about soldier's armour. It was said that when the cable had to be picked up, they would have a gutta percha core pulling up a loose sheathing, instead of the sheathing pulling up the cable. The position was likened to a man being knocked down in a suit of armour, and not being able to get up again until it was loosened. Thus, various other types of cable—some, without any iron wires, entirely dependent on hemp for their strength—have been introduced from time to time.

Such cables, however, though certainly possessing the advantage of lightness, have not proved successful in practise, and never received



View shewing the various Coverings of the Deep-Sea Cable.



MODERN ATLANTIC CABLE.

(N.B.—All types actual size.)

serious encouragement. In a type which was adopted in one or two lines—notably in the Second Atlantic Cable, a specimen of which I hold in my hand—each sheathing wire was enveloped in hemp with a view to reducing the weight, but the hemp was soon destroyed by the rusted iron wires which then remained in a loose bundle.

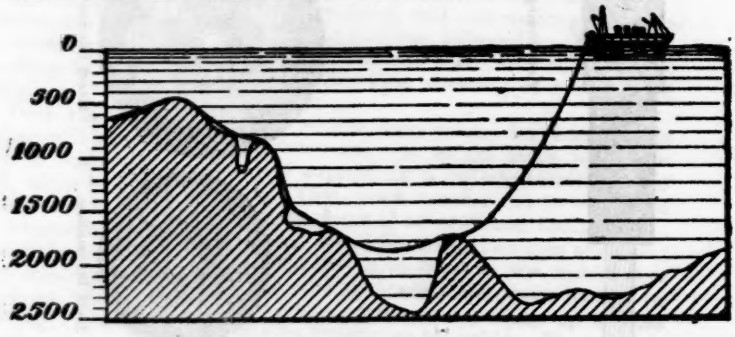
It is, indeed, a remarkable fact—peculiar in engineering—that though steady advance has been made in details, and especially in the quality of the materials used, the general type of cable is practically the same as was first determined on for the very earliest lines. As a good example, however, of the improvement in materials, it may be remarked that the available strength of the cable before you on the screen is 30 per cent. greater than that of the Atlantic cable of 1865 just referred to.

I hold here one of the deep sea (main) type cables of the enormous strength that I have named; and here is one of the heavy shore end types, some of which weigh over 20 tons per mile.

Here, too, in this case are specimens of the various types of the All-British Pacific Cable.

SUBMARINE SURVEY.

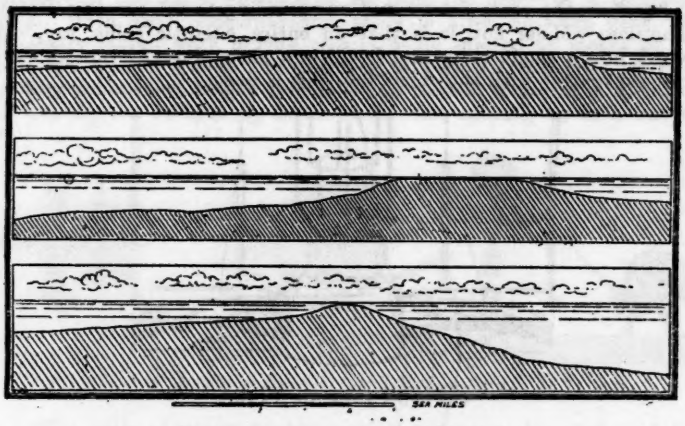
Having now dealt as far as possible with the construction of a submarine cable, I will pass on to the laying of it. Strictly speaking, the manufacture should not be embarked on until a survey of the route has been effected for determining the types to be adopted and the length of the same. In any case such a survey is essential before the actual laying takes place. A few of you may have sometimes thought that a cable floats either near the surface, or somewhere between the surface and the botttom of the sea; but that is not so, for the all-sufficient reason that it is specifically heavier than sea water; and in early days many disasters occurred owing to the lack of preliminary soundings, and the want of even a general knowledge of the bed on which the cable was destined to rest.



CABLE-LAYING OVER AN IRREGULAR BOTTOM.

Some idea of what happens when a cable is laid over a sea-bottom that has not been surveyed may be gathered from the slide before you. In this instance, you see, even if the cable does not break during the operation of laying, it is pretty certain to do so very soon after, due to the strain of being suspended from point to point.

Such irregularities as are here depicted would require very special precautions. They would, however, be best avoided altogether, if another suitable route could be found.



CONTOURS OF THE SEA BOTTOM.

This slide illustrates the sort of bottom that cables are laid on under normal conditions; and even then it is desirable to take soundings in advance at intervals of about 10 miles, lest there should be, as there often may be, a submarine mountain—or, on the other hand, a valley—on the route, such as must be avoided, or allowed for, in laying.

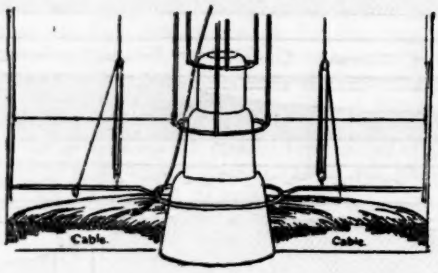
All deep water soundings are nowadays effected by means of very fine, but intensely strong, steel wire of the type employed in the treble notes of a piano, bearing a strain equivalent to 130 tons per square inch. With such a wire, and a suitable weight attached thereto, the depth is ascertained by noting the length which runs out before bottom is struck, the wire being afterwards recovered by means of a steam, or other, engine. The employment of this system enables soundings to be taken with far greater accuracy and despatch than was possible with a stout hempen line, as used in former days.

Besides measuring the depth, it is usual—by means of small metallic tubes attached to the line—to secure a specimen of the bottom; and occasionally, with the aid of a suitable thermometer, to ascertain the temperature, this also being a matter of some importance—partly in revealing the possible presence of any hot springs. Some of you may be surprised to know that the temperature at great depths is as low as 35° Fahrenheit. Thus, when surveying, or cable laying, in tropical waters, science and engineering may be combined with personal comfort by utilising a good fat sample of the oozy sea-bed for cooling the liquid refreshment of the perspiring engineer.

And here I would add that by far the most complete surveys of the ocean floor have been effected as the result of submarine cable enterprise rather than by the naval authorities of any country. This, however, is only natural; for, in our case, a thorough survey often means the difference between heavy commercial loss and complete and lasting success.

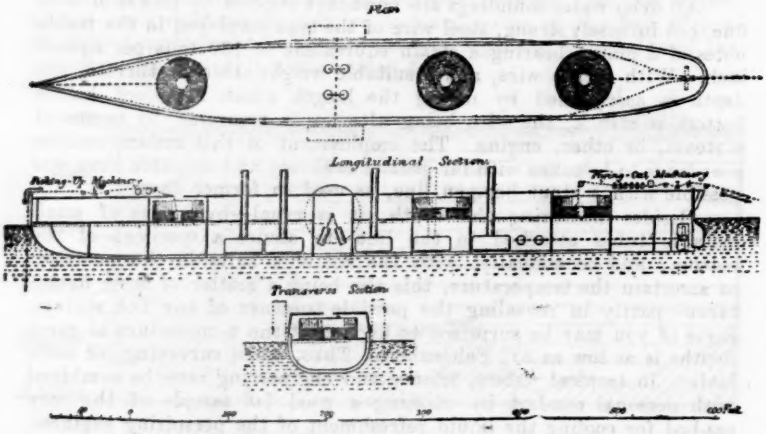
CABLE-LAYING.

Let us now return to the cable factory, where the cable having been made is being gradually shipped on board the vessel that is about to lay it on the route determined on according to the survey. People sometimes wonder how it is that an entire Atlantic cable, say, can be got into a single ship, and I will now show those of you who are least conversant with the object how this is done.



COILED CABLE IN TANKS.

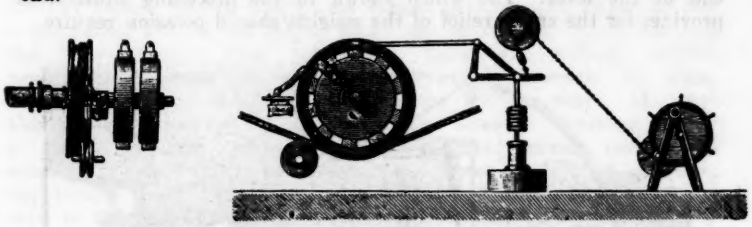
The cable is drawn out from the factory tanks into corresponding water-tight iron tanks on board—of which there may be three or four for different types and lengths of cable. The slide before you illustrates one of these, with the cable partially coiled therein—and very closely packed, as you will observe. The tank is, as you see, furnished with a frame work known as the "Crinoline." Its object, in conjunction with the conical centre piece here, is to steady the cable as



S.S. "GREAT EASTERN" CONTAINING CABLE AND MACHINERY.

it leaves the tank at a more or less high speed, and ensure it running out without accident. Mr. R. S. Newall devised this arrangement, thereby sharing with the Princess Eugenie the honour attached to the invention of a crinoline.

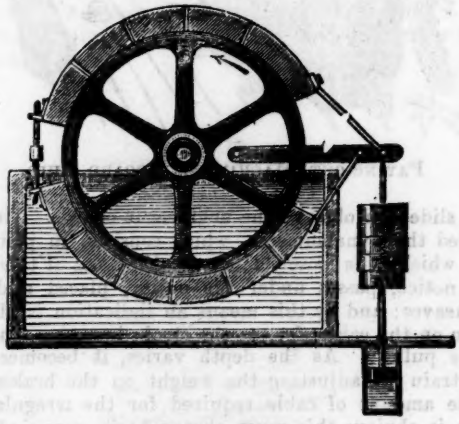
The slide before you (p. 380) illustrates the "Great Eastern" with a length of 600 feet—loaded up with the 1865 Atlantic cable. You also get here a general idea of the arrangements for paying out the cable from the stern—or picking up from the bows—of a telegraph ship. With small repairing-ships there is often no stern gear, any necessary laying work during repairs being effected by means of the bow machinery. Indeed, the picking up gear is frequently used for paying out a short length even on large vessels, to save the operation of passing the cable along to the stern after splicing on to a buoyed end.



APPOLD BRAKE AND DYNAMOMETER.

The evils of laying a cable without a proper knowledge of the contour of the sea bottom have already been dealt with; but it is almost equally bad to lay a cable without properly providing for such irregularities as are unavoidable.

This provision takes the form of laying what is known as slack cable where necessary—that is, extra cable to fill up the said irregularities, thereby avoiding suspension from point to point. This involves a due regulation of the line in its egress from the ship, in proportion to the speed of the vessel overground; and that is secured



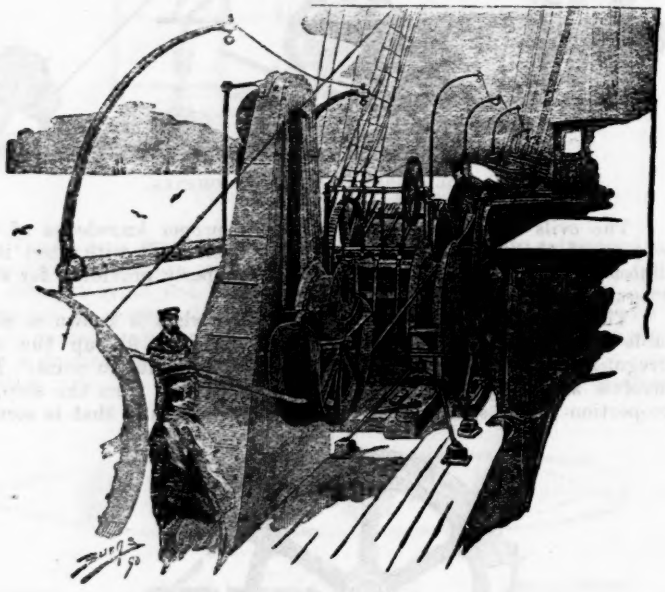
APPOLD BRAKE.

by the apparatus between the cable tank and the stern of the vessel. I have a certain filial affection for this machinery, inasmuch as it was originally introduced by my father, the late Sir Charles Bright,

for laying the first Atlantic cable. The principle of the apparatus is illustrated in the next slide.

Round this drum, the cable, on its way from the tank, takes—as you see here—several turns before passing on to a sheave towards the stern of the ship. The speed at which the cable passes outboard is controlled by the speed of this drum. On the same shaft there are, you observe, two other drums.

These latter drums run through a circular friction strap, which is tightened or loosened as required, by altering the weight at the end of the lever. The winch shown in the preceding illustration provides for the entire relief of the weights should occasion require.



PAYING-OUT MACHINERY ABOARD SHIP.

In this slide you observe the engineer-in-charge. He is watching what is called the dynamometer, which consists, in principle, of the pulley here which runs loosely in the vertical slot of this frame. The cable, you notice, passes under the pulley, placed midway between two fixed sheaves; and by this means an indication is afforded of the actual strain on the cable, for, as the strain increases, the cable raises the movable pulley. As the depth varies, it becomes necessary to alter this strain by adjusting the weight on the brakes in order to pay out the amount of cable required for the irregularities of the bottom. It is obvious this must always be in excess of the distance run by the ship overground, which might be 7 miles to 8 miles of cable.

On a given line, the average surplus cable laid to provide for the aforesaid irregularities of the bottom amounts to something like 10 per cent. of the length. Thus, taking the distance across the North

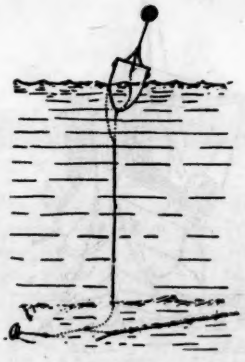
Atlantic Ocean at about 2,000 miles, the cable actually laid will amount to 2,200 miles. On this basis, and by continuous work day and night, it takes about 3 weeks to lay an Atlantic cable under favourable conditions as to weather, etc.

Testing.

While the egress of the cable is being looked after by the engineers on deck, its electrical health is being carefully tended—its pulse carefully felt, indeed—by the electricians in the testing room, who are—or should be—in continuous communication with those at the cable testing hut on the shore, where the paying out vessel has laid the line from. This takes the form of sending certain prearranged signals at certain prearranged intervals of time, accompanied by occasional interchange of remarks. If anything goes wrong—such as the cable actually breaking under a strain, or the gutta percha insulation failing under the extreme pressure of the ocean—the electricians know of it at once; and their first duty is to give notice to the engineer-in-charge, with a view to the ship being stopped and laying operations suspended.

Electrical tests for the localisation of a fault are too elaborate for dealing with on the present occasion. The skill of electricians in this most important work has been brought to a very high pitch; and, under favourable conditions, a fault can often be localised even to within a few feet—indeed, more accurately than the position of a ship can be determined. Under less favourable circumstances, and on long lengths of cable—where tests may be seriously interfered with by earth currents—localisation is sometimes very difficult, though a fault is frequently localised within a quarter of a mile in a total length of 1,000 miles.

In a similar way, navigation may, during a spell of unfavourable meteorological conditions, be equally difficult; and a ship is often not brought up to within a mile, or materially more, of what it is supposed to be, whereas, under favourable conditions, extreme accuracy is commonly secured.



A Buoyed Cable End.

Assuming that all goes well, cable laying would be continued until reaching a point a few miles from the other shore, when the

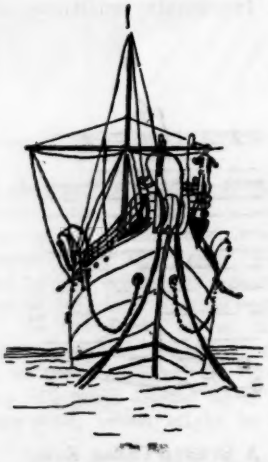
cable would be cut and buoyed, preparatory to landing it at that end. As a rule, however, the shore end has been previously landed by a smaller ship entirely occupied over this work; so that, in that case, the big vessel that has laid the main cable would approach the buoyed end of this cable.

Here you have a general representation of a buoyed cable end (p. 383); and I think, as we have so far shirked the landing of our shore end, we had better turn to that, and consider that we have taken the first course—namely, that of buoying our main cable, the actual operation not being readily described in a few words, but a general idea of which you can no doubt obtain from the slide before you.

As it would be impossible to haul a heavy cable ashore along the bed of the sea, it has to be floated ashore on the surface; and this is usually done by barrels, or preferably by india rubber balloon buoys, being attached to it at intervals.

LANDING THE SHORE END FROM A TELEGRAPH SHIP.

Here we have a view illustrating the method generally, showing the arrangement and tackle adopted for hauling the end of the cable ashore by means of steam gear aboard-ship.



SLIPPING THE FINAL BIGHT OF A CABLE.

Let us now suppose we have laid our shore end. The telegraph ship then proceeds paying out towards the buoyed end of the main cable. Having picked this up, a splice is effected between the two cable ends. Preparations are then made for letting go the final bight of the entire line, the final operation of slipping the bight being shown.

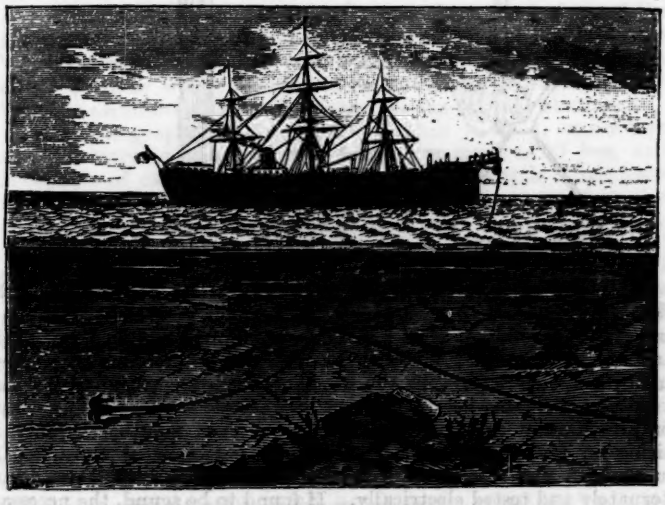
THE EVENTUALITIES OF A CABLE.

The eventualities of a submarine cable are many. It may be torn by an anchor, crushed by a rock, or seriously damaged by a coral reef, such as abound in the tropics. Some of the growths

THE TEREDO NAVALIS.

often found on a cable tend to gradually decay the iron sheathing wires. Then, again, a cable is sometimes severed by a sea-quake.

But the little animal that makes itself most objectionable, from the cable engineer's standpoint, is the insignificant-looking teredo navalis. This little beast is intensely greedy where gutta percha is concerned, working its way there between the iron



CABLE GRAPPLING.

wires and between the serving yarns. The silica in the outer cable compound tends to defeat the teredo's efforts at making a meal off the core; and this defeat is further effected by the served core being enveloped in a thin taping of brass—applied spirally during the inner serving operation, and in a similar manner. But where the bottom is known to be badly infected with these little monsters of the deep, the insulator is often composed of india rubber which has no attractions for the teredo, and possesses a toughness, moreover, which is less suited for its boring tool than the comparatively cheese-like gutta percha.

CABLE REPAIRS.

We see then that, from one cause or another, faults occur in most cables from time to time. These require to be electrically localised from the cable testing hut, on principles already briefly alluded to; and a ship sent out to the supposed position to grapple for the line, pick it up and effect the necessary repairs.

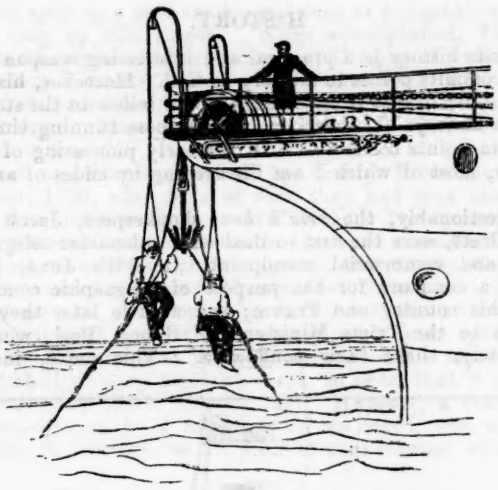
The preceding view gives you a general idea of the operation of grappling for a cable.

CABLE GRAPNEL.

GRAPPLING ROPE.

Here you have an ordinary type of grapnel for hooking on to the cable, and also the line to which the grapnel is attached. This is composed of strands of steel and hemp combined, and bears a strain of as much as 20 tons. There are also several other forms of grapnel, some with aprons to prevent the prongs becoming engaged with rocks.

When the cable has really been hooked and picked up—an operation which may entail several weeks, or even months, if only in waiting for favourable weather—the bight is secured at the bows, as you see here, and afterwards cut. Each end is then brought on board alternately and tested electrically. If found to be sound, the necessary repairs are then effected on principles already set forth.



BIGHT OF CABLE SECURED AT BOWS.

CABLE SHIPS.

Having briefly described most of the operations connected with cable work, I will now show you views of some worthy representatives of the telegraph fleet,[1] which amounts to 56 in all, including small repairing vessels.

The "Colonia" is the latest of the big telegraph-ships, having—with her sister-ship the "Anglia"—entirely outstripped all others in size and every other respect. This vessel, and the "Anglia," were built for the laying of the All-British Pacific cable, which they laid in the year 1902 with complete success. With a length of 500 feet and a carrying capacity of 11,000 tons, either of them would be capable of laying an entire Atlantic cable with the assistance of a smaller vessel for landing the shore ends.

The telegraph-ship "Silvertown," built in 1873, comes next in size and carrying capacity. Her beam is as much as 56 feet, and she is capable of carrying 8,000 tons, though her length is not considerable. I have had the pleasure of travelling a great number of miles in this vessel in connection with various cable-laying expeditions.

I am sorry that I am not able to show you the "Faraday"—a cable-ship of very similar dimensions, built a year later. Named after one of the greatest electricians, this vessel is of special interest owing to her design—due to that distinguished man, the late Sir William Siemens. She resembles a penny steam-boat to the extent of having bows aft as well as forward, the idea being to facilitate cable operations.

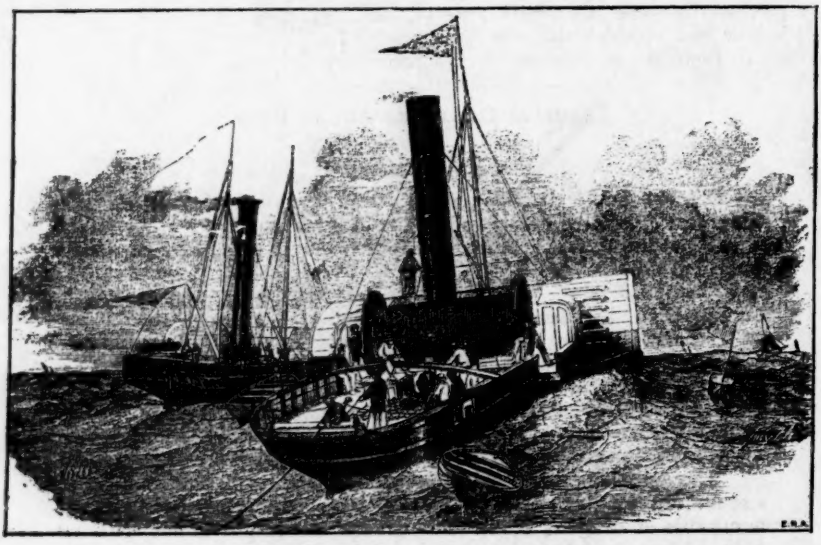
But though I cannot show you the "Faraday," I can show you the Post Office Telegraph-Ship "Monarch." She is concerned in the physical well-being of our telegraphic communication with our Irish and continental neighbours by means of comparatively shoal water cables.

[1] These views of ships appear on another page.

HISTORY.

Realistic history is a practical and interesting weapon of instruction. It commits points to memory so well. Moreover, history—with a personal touch—should surely help one to follow in the steps of those that make history. I, therefore, now propose running through some of the main points connected with the early pioneering of submarine telegraphy, most of which I am illustrating by slides of an historical nature.

Unquestionably, the *bric à brac* shopkeepers, Jacob and John Watkins Brett, were the first to deal with submarine telegraphy from a public and commercial standpoint. On 16th June, 1845, they registered a company for the purpose of telegraphic communication between this country and France; and a little later they addressed themselves to the Prime Minister, Sir Robert Peel, who did not, unfortunately, share their confidence. This move, indeed, only



LAYING THE FIRST CHANNEL LINE.

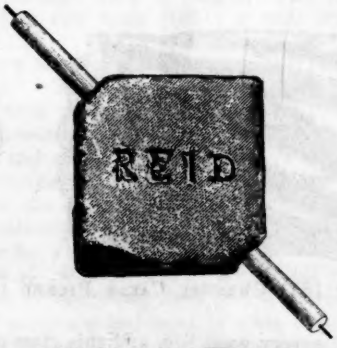
involved the Bretts in a departmental correspondence—more academic than useful, in which they were diplomatically passed backwards and forwards from one Government office to another.

By 1849, however, the Bretts had obtained consent from the authorities of both countries to lay a cable across the Straits of Dover.

The slide before you illustrates the laying of this line from the "Goliath"—a small Thames tug with a very big name! The line only consisted of a gutta percha covered copper wire. This was unwound across the Channel from the huge reel you see on deck here, and the further end connected to a Cooke and Wheatstone needle telegraph instrument set up in a bathing machine. The carrying out of this enterprise excited little or no attention at the time. It was,

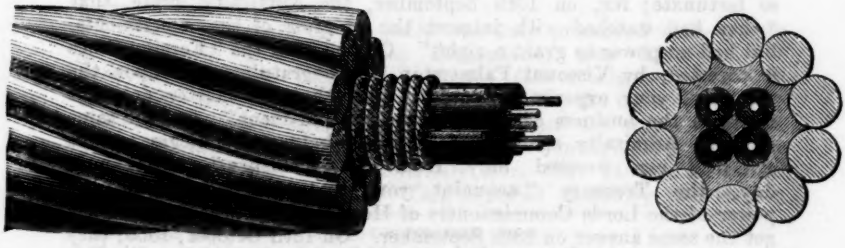
indeed, looked upon as a mad freak—and even as a gigantic swindle—indulged in only by wild minds. When accomplished, *The Times* remarked, in the words of Shakespeare:—"The jest of yesterday has become the fact of to-day." But a few hours afterwards it might with equal truth have been said:—"The fact of yesterday has become the jest of to-day!" Messages were, however, certainly sent through this insulated wire.

Brett had a document, signed by twenty Frenchmen, dated 6th September, 1850, who declared that they had seen the electric telegraph working between France and England. The signals, it must be confessed, were rather incoherent; the operators at each end blamed those at the other, and tauntingly suggested that the excitement, or something else, must have gone to their heads. In any case, the glory of this telegraph was, unfortunately, short-lived, for after the first evening it maintained an obstinate reserve, and never spoke again. An attempt was then made to raise the wire; but as a leaden weight had been attached at every hundred yards, in order that it might be successfully sunk, all efforts were in vain. However, a considerable length was brought up by a fisherman in his trawl, who carried it off to Boulogne in triumph, as "a piece of rare seaweed with a pith of gold!"



1850 Line and Weight.

Here you see the line which did such short duty with the leaden weights attached. You will observe that Mr. Reid (the contractor)

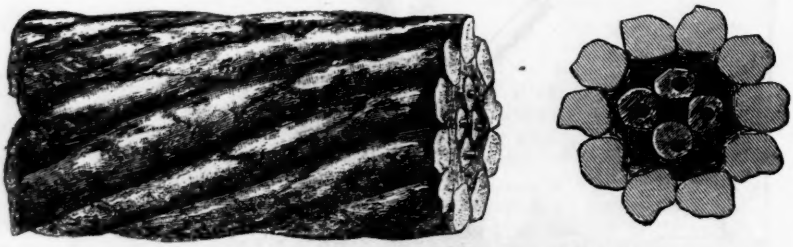


The First Channel Cable, 1851.

was determined that, at any rate, the fishes at the bottom should know of him—and that he made leaden weights!

Then, again, on 19th December, 1850, a concession was granted to Jacob Brett by the French Government, and on the strength of this the Submarine Telegraph Company was formed. But £300 was all that the public would subscribe, because it had been *proved* that submarine telegraphy was an impossibility! Yet these early pioneers, with that peculiar obstinacy that characterises inventors, actually went on believing in their own ideas.

Mr. Crampton, the well-known railway engineer, came to the rescue with £7,500 of his own and a similar amount from his friends. Then Mr. Küper, a colliery engineer, came along and said: "Why not protect your gutta percha covering by an iron sheathing?" Well, the cable with its sheathing was made, and on 25th September, 1851, a procession, with a man-of-war to lead the way, started from the South Foreland to the shores of France. All went well until they were in sight of the opposite coast, when the cable gave out. Another mile was ordered, manufactured, and laid; and on 13th November, 1851, the public sent a message through a submarine cable—the cable on the screen before you—for the first time in the history of the world. As you will observe, there were four insulated conductors covered with hemp and iron wires.



PIECE OF 1851 CHANNEL CABLE PICKED UP LATER.

The cable had a very good life, and this class of armour has been adhered to ever since. The slide here illustrates how little this cable was affected by time, when picked up a good many years later.

The Bretts then applied to the Government for a monopoly to electrically connect England and Ireland. This time they were not so fortunate; for, on 10th September, the Admiralty wrote, that "they had watched with interest the progress of the experiments, but had no power to grant a right." On the 18th the "Foreign Office is directed, by Viscount Palmerston, to congratulate you upon the success of your experiment, and to state that the matter does not relate to the business of his Lordship's Department." On the same day the Admiralty again wrote, "that whatever privileges can be granted, can proceed only from the Treasury." The next day, the Treasury "acquaint you that it is not in the power of the Lords Commissioners of Her Majesty's Treasury." They got the same answer on 28th September. On 18th October, 1850, they received the following letter from the Treasury:—"Although sensible of your perseverance in bringing the submarine telegraph about, and in view of the great public benefit likely to arise in connection . . . but it is not in their Lordships' power, etc."

Cables were eventually laid between England and Ireland; and although the first two were failures, in 1853 my father successfully connected the two islands—this first piece of cable work forming part of his honeymoon at the age of 21. I hold a specimen of this line in my hand. It was similar to the Dover-Calais Cable here referred to, but contained six insulated conductors round a heart of hemp. This particular specimen—somewhat rusted, as you see, by time—illustrates the effects of pressure against a rock.

Then followed a number of lines laid across the English Channel, in the Mediterranean, and elsewhere. Many of these early attempts either resulted in breaking the cable, or, in paying it out with so much slack that it reposed in festoons at the bottom of the sea, as there were no means then of indicating what force was being exerted by the brake used to restrain the running out of the line.

We now come to the period when a much more difficult problem was dealt with—I mean spanning the Atlantic Ocean by laying and speaking through a cable 2,000 miles in length, the depth being upwards of 3 miles. Many eminent scientists had said it would be impossible to deposit the line at all at so great a depth; and that even if laid, it would be a mathematical impossibility to transmit electrical signals through such a length. The Atlantic cable was, indeed, considered at this time (1857) a wild freak of people that were to be pitied.

Here you have the portraits[1] of some of those who were the subject of "pity." Mr. Brett had, as I have shown, already been associated with other pioneer cables. Mr. Cyrus Field was a wealthy American business man of far-seeing and enormously active character,[2] and my father had already attracted considerable attention as an engineer. These were the three "projectors," and my father was also the engineer.

There were evidently some spirits who believed in the enterprise—or in those at the back of it—for the Atlantic Telegraph Company was formed within a few days, the entire capital being raised almost entirely in England by the public issue of 350 shares of £1,000 each.

The proposed route was surveyed in what we should now consider a somewhat "sketchy" fashion; for whereas, in the present day, we sound at intervals of about 10 miles, at that time sounding every 100 miles was considered abundant. The general character of the bottom was, however, correctly arrived at from the specimens brought up, being, in fact, the usual oceanic ooze of extremely minute shells—a perfect bed for cables.

The manufacture of the cable was duly proceeded with—partly at Greenwich and partly at Birkenhead, near Liverpool. I have here, in my hand, one of the few specimens of it in existence. As you will see, on close inspection, the outer wires were composed of several strands of fine wire. Thus the entire length of wire employed was as much as 340,500 miles—enough to engirdle the earth thirteen times and considerably more than enough to extend from the earth to the moon. This stranded sheathing had certain

[1] These portraits appear on a separate page.

[2] Mr. Field had achieved a commanding position in respect to any such scheme by acquiring a concession from the late Mr. F. N. Gisborne (a well-known Canadian engineer) for communication between Newfoundland and Canada.

mechanical advantages at the outset, but has since been found by experience not to be a durable type of armour.

The Governments of the countries concerned encouraged the scheme to the extent of lending certain vessels for laying the cable, as they had done previously for the survey.

The main contribution from the United States was the "Niagara" —a splendid example of the frigates of that time. A smaller vessel was also provided by each Government to land the ends, pilot the way, and act as consorts generally.

Mishaps soon occurred; for it was only four miles that had been paid out when the cable broke. Another start was made; but, after 226 miles had been laid, it again broke—this time, however, at a depth of 2 miles. So ended the first attempt to electrically connect America with Europe. Morse, who was on board in an honorary capacity, recorded the circumstances as follows:—"The cable parted just before day-break. The machinery having stopped, all hands rushed on deck and gathered in mournful groups; their tones were sad, their voices low, as if a death had occurred on board."

The next year (1858) more cable was made, and a second expedition started with 3,000 miles. The two vessels were this time to meet in mid-ocean and make a joint, and then sail in opposite directions, laying the cable towards their respective shores. This they did, but the joint broke. They made a second, and again it broke. They made a third, and then one ship sailed towards Ireland and the other towards America.

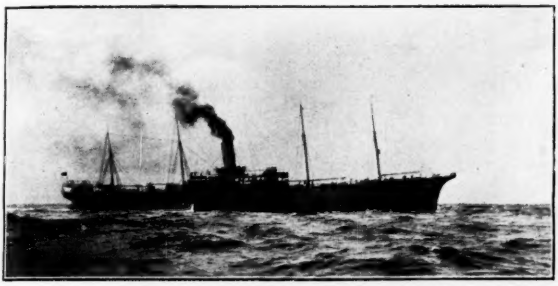
On her way, the "Agamemnon" encountered a whale, and though the ponderous monster made commendable attempts to carry off the cable, these attempts were attended with no evil result. The "Niagara," however, had not gone far before another break occurred which ended in the loss of 500 miles of cable. Sufficient yet remained on board for a third trial.

Meanwhile, however, both ships had run out of stores; and it was therefore necessary to put into Queenstown. On the way, a terrific storm was encountered, and the "Agamemnon" nearly "turned turtle." The boots, food, and crockery—not to mention the coals—got, of course, terribly mixed up; but so did the cable in the tanks, and this was a much more serious affair.

Matters were, however, righted; and after stores had been procured, the telegraph fleet again met in mid-ocean to make the splice, and again set forth on their respective work. The first expedition created considerable excitement, but when it came to the second and third, everyone—except the shareholders—merely pitied those that were continuing such a futile errand. However, the pity was now beginning to be misplaced, for this time the entire line was laid successfully.

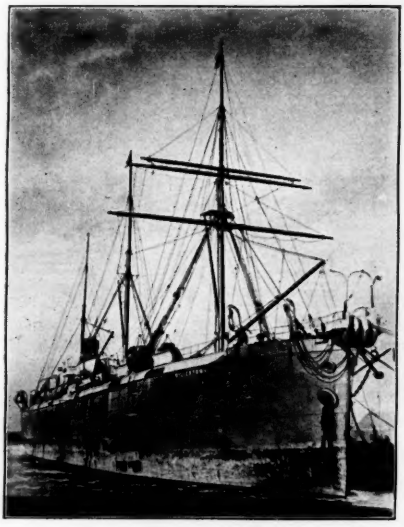
Though having little to do with the actual work, our American cousins were, as might be expected, more demonstrative on the subject, and wild excitement prevailed on the landing of the end at the Newfoundland Station. But even *The Times* remarked: "Since the discovery of Columbus nothing has been done in any degree comparable to the vast enlargement which has thus been given to the sphere of human activity."

It was on 5th August, 1858, that England spoke for the first time electrically with America. Formal and reverential were the

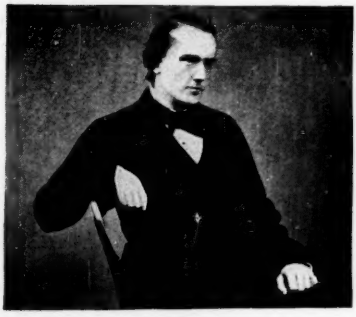


T.S. "COLONIA."

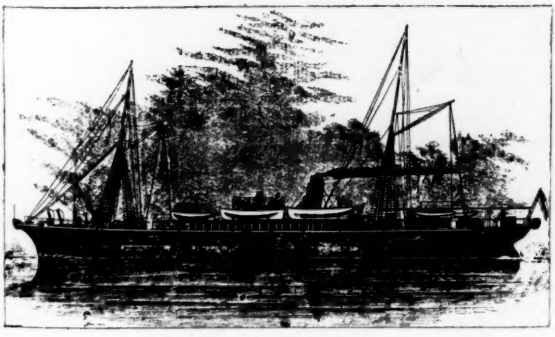
PROFESSOR WILLIAM THOMSON
(AFTERWARDS LORD KELVIN).



T.S. "SILVERTOWN."



MR. (AFTERWARDS SIR CHARLES)
BRIGHT.



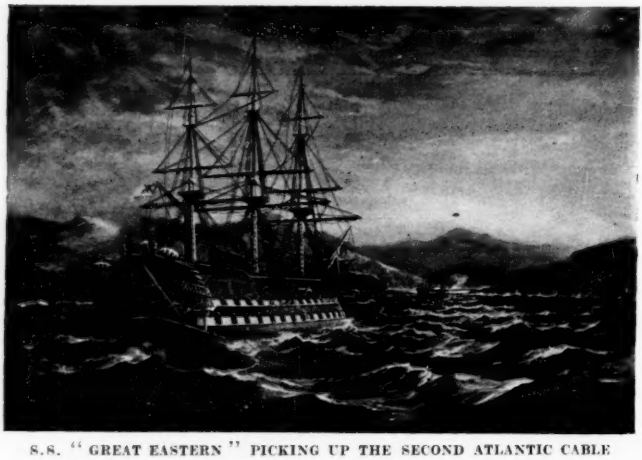
H.M.T.S. "MONARCH."

MR. CYRUS FIELD.

[P.T.O.

H.M.S. "AGAMEMNON" COMPLETING THE FIRST ATLANTIC CABLE.

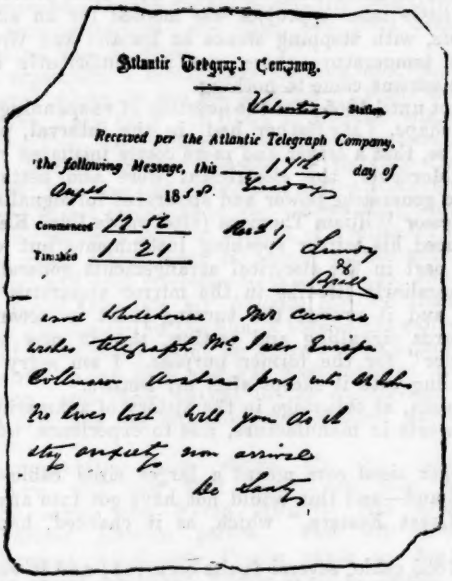
U.S.N.S. "NIAGARA"
ENGAGED ON THE FIRST ATLANTIC CABLE EXPEDITION.



S.S. "GREAT EASTERN" PICKING UP THE SECOND ATLANTIC CABLE
AT 0.50 A.M. ON SEPTEMBER 2ND, 1866. (DEPTH 2 MILES.)

first words of greeting between Her Majesty Queen Victoria and the President of the United States.

It must be admitted that the cable never worked very satisfactorily from the outset; for the message from the United States' President to our Queen occupied over thirty hours in transmission, though only containing 150 words! Moreover, the utmost speed achieved was some 6 words a minute, whereas a modern Atlantic cable, with modern implements, can—as I have already mentioned—be worked up to 100 words per minute. Indeed, that is approximately an ordinary working speed.


Atlantic Telegraph Company.

Received per the Atlantic Telegraph Company,
the following Message, this 17th day of
August 1858.

Commenced 12 52 Rec'd
Finished 1 21

and Wilderness Mr Curtis
under telegraph Mr Water Engineer
Collision Arabia fog ship Atlantic
no lives lost will you do it
they expect on arrival
be thankful

THE FIRST PUBLIC NEWS MESSAGE.

This is the first public news message that was sent through the cable; and in allaying the anxiety of passengers after collision between two ships, it served a most useful purpose. The line also further illustrated the great utility of a cable service, by conveying two messages from the War Office to Canada, the effect of which was to countermand the return of two regiments, thereby saving the expenditure of £50,000!

But though doing useful work for some 2 months, the line was gasping under its efforts throughout, and gradually reached the sinking stage. It was suffering—and ultimately succumbed—from the effects of mistaken electrical views, in which even the great Faraday shared. The line was, indeed, an electrical failure, though a complete engineering success. It had been proved that such a length of cable could be laid in really deep water; and, though various mishaps had occurred before final engineering success was achieved, there were only due to unavoidable accident on the one hand, and lack of perfection in manufacture on the other, such as could be improved on by the

experience gained. My father, the engineer-in-chief, was knighted at the age of 26 in connection with this pioneer work.

From the next cable, however—that laid by the Government in the Red Sea in 1859—nothing useful was learned. The sections failed one after the other, and it is doubtful whether a message was ever sent through the whole of the cable; but it is certain that the British public have paid, are paying, and will continue to pay till next year, £36,000 a year for the privilege of having put some copper-wire, gutta percha, and iron sheathing at the bottom of the Red Sea.

There were several other cables laid soon after—from Malta to Alexandria, to India and elsewhere, and these proved a complete success. A little later a project was mooted for an extreme North Atlantic cable, with stepping stones at Iceland and Greenland; but possibly the temperature there was not sufficiently inviting, for certainly the scheme came to nothing.

It was not until 1865 that the question of re-spanning the Atlantic took active shape. My father had, in the interval, persuaded the powers that be, that a larger and more costly insulated conductor was essential. Moreover, the electricians were also better advised in regard to the generating power and apparatus for signalling purposes; indeed, Professor William Thomson (afterwards Lord Kelvin) had not only introduced his mirror speaking instrument, but was taking a more active part in the electrical arrangements generally. There is something peculiarly life-like in the mirror apparatus on the table before you; and it proved the turning point in ocean telegraphy, both as regards signalling and testing, though now superseded by the "Recorder" for the former purpose. I am sorry there is not time for dealing with it except after my lecture.[1]

Then, again, at this stage in the history of submarine telegraphy, the improvements in manufacture, due to experience, were altogether encouraging.

The larger sized core meant a larger sized cable—the cable I hold in my hand—and this would not have got into any other vessel than the "Great Eastern," which, as it chanced, happened to be available

In the 1865 cable, several faults occurred; and it was feared they were produced intentionally by people on board sticking pins, or iron wire, through the gutta percha. They watched the tanks, but still the faults occurred, and while attempting to haul the cable back to repair a fault, the cable snapped, after 1,186 miles had been laid. For nine days they made strenuous efforts to pick up the cable; but though they grappled it many times, the rope broke, and thus the 1865 cable had to be abandoned. A new cable like that of 1865 was then made by the Telegraph Construction and Maintenance Company. This Company contributed £100,000, and undertook to make and lay the cable for half-a-million of money, whether it was successful or not, this sum to be increased to £600,000 if it were successful, and to £737,000 if they could also pick up and complete the 1865 cable. So three-quarters of a million of money was the prize;

[1] Since this lecture was delivered we have had to mourn the death of Lord Kelvin. One of the most remarkable features of his great career—that of pursuing an invention, entirely himself, up to the point of practical application—was strikingly brought out in connection with his cable signalling apparatus.

and it was won. Nowadays the prize would be only half-a-million for a cable giving, of course, far better results.

This new cable, after a few further misfortunes, was eventually laid. From an engineering standpoint, however, this was really work that had already been effected 8 years previously, with about the same number of misfortunes, though with no applicable experience to go upon. The work to come—that of recovering the 1865 cable—was, indeed, the matter of the moment.

For thirteen days they alternately hooked and lost the cable. Once they brought it to the surface; but it slipped away from them like a great eel. On lowering the grapnel, however, for the thirtieth time they succeeded—thanks mainly to Mr. (Sir Samuel) Canning, the engineer to the contractors; and thus, two good cables were laid between England and America.

On this expedition a remarkable incident occurred—that of the "Great Eastern" whilst in the act of picking up the cable, bumping against the very mark buoy put down to indicate the supposed line of the cable. This was, indeed, a striking suggestion of accurate navigation! For it we were indebted to the late Captain Henry Moriarty, R.N., who was lent by the Admiralty as Navigator.

I am sorry that I cannot show you the machine which ultimately succeeded in picking up a cable at a depth of 3 miles for the first time. This was the great achievement in regard to the second and third Atlantic cables; and with reference to this machine, *The Times* representative on board (the late Sir William Howard Russell), said:—"So delicately did she coil in the film of thread-like cable that she put one in mind of an elephant taking up a straw in its proboscis."

Other cables to the East and Far East followed in more or less rapid succession; and these, thanks to the commercial foresight and enterprise of men like the late Sir John Pender, have all proved a lasting success.

The accompanying map shows all the cables laid up to date. You will see that there are now as many as sixteen cables across the North Atlantic and several different routes to various Eastern points. You will observe further the much-discussed All-British Pacific cable to Australasia, and also the more recent American Pacific cable to Japan. Both these run over depths of 4 miles; and just as the first Atlantic cable was considered at the time a wild freak of people that were to be pitied, so also the first Pacific cable was similarly spoken of by some, mainly on account of the great length—3,458 nautical miles—of one of the sections. It was, however, laid almost without a hitch, and will no doubt serve an increasingly useful purpose.

In the present day, cables have no history. Happy is the cable without a history! It must not, however, be supposed from this that we do not have occasional minor mishaps nowadays. Even though our materials are so vastly superior to what the pioneers had at hand, there are still the usual eventualities, many of which—as we have seen—are scarcely under control; and there comes a time for all cables, when the iron wires are too decayed to permit of profitable repairs, bearing in mind the fact that a repairing expedition often costs as much as £200 a day. Most of these cables have been manufactured on the banks of the Thames—in the neighbourhood of Greenwich and Woolwich—this being the only branch of engineering enterprise that remains almost entirely British.

On the wall you will observe certain approximate data that may be of interest. As with other branches of the subject, I could well spend an afternoon in discussing the social, political, diplomatic, and strategic value of cables; and it is in the latter respect—added to that of Imperial unity—that the All-British Pacific cable may some day prove of inestimable value to the nation.

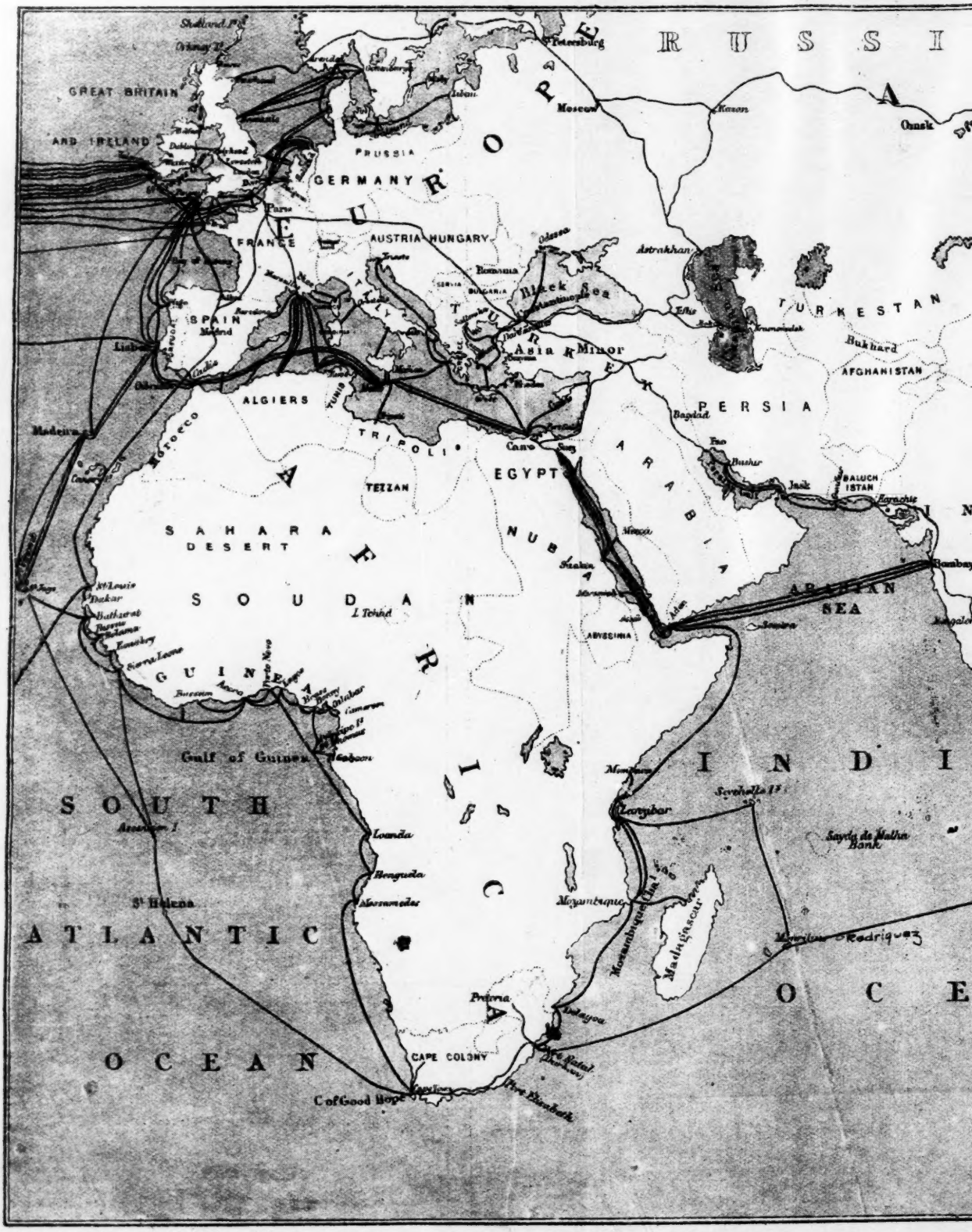
Personally, I am not one of those who believe in the early consignment of cables to the region of antiquarian museums, though having great faith in the utility of wireless telegraphy for all maritime purposes, and as a helpmate to our cable systems. Certainly, so far, there are no signs of cables being replaced by wireless telegraphy when further means of communication are required. Only a few weeks ago, whilst in Egypt, I read the record of a meeting in which the chairman of a well known cable making company stated that "Marconi had done away with the manufacture of telegraph cables." I also, by the same mail, received news that the three large cable works were particularly busy with submarine cable orders just received for various parts of the world; and, perhaps, it should be added that on enquiry I was informed on good authority that the chairman in question never expressed what he was reported to have said. As a matter of fact, some 85,000 miles of cable have been made and laid since the Marconi Company was established, ten years ago—nearly five times as much, indeed, as was made and laid during the ten previous years. Whilst I am a great believer in the future of wireless telegraphy as an aid to cables for the purpose of telegraphic communication—mainly in directions where cables are ineffective—I do not think that the wireless telegraphy that we know of at present will ever actually replace telegraphy by cables.

Though I have not been able to make and lay a cable for the purposes of this meeting, I have brought here a number of specimens of cables which have done or are still doing, good service in various parts of the world; and I may, perhaps, mention the fact that the first message sent on this cable—the first cable to India—announced your lecturer's entry into the world. But a specimen of more material interest is this one of the Atlantic Cable of 1874, which was picked up for repairs five years ago from a depth of 2,164 fathoms, and is still in splendid condition.

I am also able to show you here the electrical equivalent of a cable being worked through in precisely the same way that messages are sent through trans-Atlantic and other lines.

APPROXIMATE STATISTICS.

Total length of cable laid—257,000 miles.
Total cost of cable laid—£52,000,000.
Cost per mile, construction and laying—£200.
Useful life of a cable—30 to 40 years.
Messages conveyed by cable per annum—6,000,000.
Messages conveyed by cable per day—15,000.
Maximum working speed by cable—100 words per minute.
Percentage of code and cypher messages—90 per cent.
Maximum cable tariff—To Accra (Africa), 7s. per word.
Minimum cable tariff outside the Inland Post Office Telegraph System—By Government cables, to the Continent, 2d. a word. By Companies' cables, to United States or Canada, 1s. per word (originally £1).



J. J. K. & Co., Limited, London.

THE WORLD'S TELEGRAPHIC S

N.B. ONLY THE PRINCIPAL LAND LINES WHICH CONNECT UP TO THE SUBMARINE

WORLD'S TELEGRAPHIC SYSTEM,

PAL LAND LINES WHICH CONNECT UP TO THE SUBMARINE CABLES OF THE WORLD ARE SHEWN HERE.

NORTH AMERICA
UNION OF CANADA
UNITED STATES
NORTH ATLANTIC OCEAN
GREAT BRITAIN AND IRELAND
SPAIN
THE AZORES
Madeira
MOROCCO
SAHARA DESERT
Montreal
Washington
Wilmington
Bermudas
Bahama Is
Gulf of MEXICO
MEXICO
Mexico
Galveston
WEST INDIA ISLANDS
Haiti
Jamaica
CARRIBBEAN SEA
CENTRAL AMERICA
Panama
VENEZUELA
Georgetown
Guiana
Para
Fortaleza
Pernambuco
COLOMBIA
Galapagos Is
ECUADOR
Payta
PERU
BRAZIL
Bahia
Arica
BOLIVIA
Rio Janeiro
Santos
Montevideo
URUGUAY
Buenos Ayres
Santiago
CHILI
PATAGONIA
SOUTH AMERICA
SOUTH ATLANTIC OCEAN
St Louis
Bathurst
Sierra Leone
GUINEA
Ashanti
Ascension
St Helena
Charles Enright.

NAVAL NOTES.

Home. The following are the principal appointments which have been made:—Admiral—Sir A. Fanshawe, K.C.B., to be Commander-in-Chief at Portsmouth. Vice-Admiral—Sir J. Durnford, K.C.B., D.S.O., to be President of the Royal Naval College, Greenwich. Captains—W. F. Slayter to "Eclipse"; H. C. Da Costa to "Challenger"; J. A. Fergusson to "Shannon"; W. O. Boothby to "Minotaur." Commanders—C. T. M. Fuller to "Alacrity"; F. G. Bird to "Perseus"; H. A. Adam to "Barham"; R. F. Parker to "Diamond."

Navy Estimates, 1908-1909: Précis of Lord Tweedmouth's Explanatory Statement.—The Estimates for 1908-9 amount to £32,319,500, as opposed to £31,419,500 for the current year.

A statement of the gross expenditure on the Navy Service has been placed at the beginning of the printed Estimates, which shows that although Parliament is asked to vote £900,000 more money this year than last, the total outlay for the year will stand at a figure of £13,984 only in excess of that for 1907-08.

It is an accepted axiom in the finance of the Navy that the governing factor is the provision for new construction, but for the next financial year a variety of unusual causes combine to create an actual increase in the cash provision which Parliament is asked to vote for the Navy, in spite of the fact that the new building programme put forward by the Admiralty is exceedingly modest.

In 1904-5 the Estimates stood at £36,889,000. The succeeding years have shown successive reductions of £3,500,000 in 1905-6, £1,520,000 in 1906-7, and £450,000 in 1907-8 (as I explained in my Statement last year, the reduction then was really £1,427,091, in consequence of the transfer of loan expenditure to the Works Vote).

In each of these years of falling Estimates the Admiralty were able to reduce the cash provision for stores by, on the average, £1,000,000—the figure last year being £1,241,800—owing to the large redundancy of stores created by the reforms in dockyard administration and by the redistribution of the Fleet, which were determined on and carried out by the late Board of Admiralty. Of these surplus stocks about half-a-million's worth still remain and will be exhausted during the coming year.

A fresh sum of some £700,000 has, therefore, to be provided to buy the balance of Naval stores required for 1908-9. By 1909-10, surplus stocks will have practically disappeared, and then the whole of the stores required for the Fleet will have to be provided for in cash by Parliament.

Apart from the cessation of the abnormally low cash provision for stores, there are certain items in the Estimates which show an increase, over which the Board of Admiralty have no control whatever. Improvements in pay granted in previous years increase the Pay Vote by £150,000; the Pension Votes are £70,000 higher; a sum of £300,000 has to be found to provide the balance of £500,000 for cooling the magazines on board

Home. His Majesty's ships — a service announced to the House of Commons in last year's Estimates Debate; the Cunard subsidy for the "Lusitania" and "Mauretania" stands now at the full amount of £150,000 per annum; prices have gone up, by £284,000 in coal alone; and the annuity in repayment of advances under the Naval Works Loan Acts now reaches the large sum of £1,264,000. In fact, Parliament and the Board are faced with automatic or uncontrollable increases which make any reduction of the total Estimates impracticable.

By strict economy the Admiralty have been able to bring down the inevitable increase to £900,000, the figure we now ask Parliament to sanction.

It is interesting to recapitulate the salient features of Naval expenditure during the last eight years :—

	£
The total net sum voted for Naval Services in 1900-01 was	30,041,900
This was increased by about a million for the two subsequent years, and in 1903-04 it advanced to £35,727,500. In 1904-05 it reached its highest limit, namely	36,889,500
In 1905-06 there was a decrease of	3,500,000
And in the two following years an aggregate decrease of	1,970,000
The increase proposed in 1908-09 is	900,000
Bringing the net total to	32,319,500
Now taking loan money :—	
The annuity under the Naval Works Acts first became finally chargeable to Naval funds in 1902, the amount for that year being	122,255
This has increased each year on account of fresh advances of loan money, until it has reached a total of—for 1908-09	1,264,032
The expenditure on Works under the Naval Works Acts began in 1895-96, in which year it amounted to	721,099
It gradually increased until in 1904-05 it amounted to	3,402,575
In the last completed year, 1906-7, it had fallen to	2,431,201
It is estimated that the outlay from loan in 1907-08 will be	1,135,000
And in 1908-09	896,925

Shipbuilding and Repairs.

New construction for the year will cost £7,545,202, against £8,100,000 for 1907-08. The continuous fall in the estimate for new construction from the maximum of £11,654,176 in 1904-05 is thus carried on, and Parliament is asked to vote £4,108,974 less than it was four years ago. Of this sum of £7,545,202, £6,795,202 will be spent on the continuation of ships already under construction, and £750,000 in beginning work on ships of the new programme, which is composed as follows :—

1 Battle-ship (improved "Dreadnought" class);
1 Large Armoured Cruiser;
6 Fast Protected Cruisers;
16 Torpedo Boat Destroyers;

and a number of Submarine Boats estimated to cost £500,000 in all.

Home.

This programme suffices for 1908-9; whether and to what extent it may be necessary to enlarge it next year, or in future years, must depend upon the additions made to their naval force by foreign Powers. His Majesty's Government have every intention of maintaining the standard of the British Navy, which has hitherto been deemed necessary for the safeguarding of our national and imperial interests.

Between the 1st April, 1907, and the 31st March, 1908, the following ships will have been completed and become available for service :—

1 Battle-ship ("Lord Nelson").
3 Armoured Cruisers ("Warrior," "Shannon," and "Minotaur").
3 Torpedo-boat Destroyers ("Cossack," "Mohawk," and "Tartar").
10 Torpedo-boats (of the Coastal Destroyer type).
8 Submarines.
1 Repair Ship ("Cyclops") and the New Royal Yacht "Alexandra."

On the 1st April, 1908, there will be under construction :—

7 Battle-ships.
4 Armoured Cruisers.
1 Unarmoured Cruiser.
10 Torpedo-boat Destroyers.
20 Torpedo-boats (of the Coastal Destroyer type).
18 Submarines.

This year again there has been some delay in the completion of contract-built ships, owing to labour disputes between employers and their men in the private shipbuilding yards. A continuance of this delay may involve a modification in the numbers of ships given above.

Several incidents occurred early in 1907, which gave us cause to suspect that the method of storing cordite in magazines on board-ship required alteration, in order to meet certain dangers that had been discovered to arise from cordite which is exposed to a high temperature. The matter did not admit of delay, and the Admiralty decided, with the approval of a strong scientific committee, presided over by Lord Rayleigh, to fit the cordite magazines with cooling apparatus, and to destroy all cordite that had been long in a hot climate. The cooling apparatus is expensive, and the work, when completed, will have cost £500,000; but the necessity for dealing promptly with the danger will not need further statement. The progress on this work has been very prompt and satisfactory, and the amount estimated for it during the year will be fully spent. It has necessitated an increase in the numbers of men employed in the dockyards, and a slight further increase was also necessary to deal with the large number of casualties to torpedo craft and other vessels after the Fleet Exercises had terminated. The remedy of these defects is nearing completion, and the present progress of repairs is now in a normal and satisfactory condition.

The cost of maintaining the torpedo craft in an efficient condition is increasing as the vessels get older, and many of them are due for large boiler repairs during the present year. Before carrying out this work in the older ones, a careful survey will be made to ensure that they are worth this expenditure. The increasing power of machinery and boilers, due to the higher speeds adopted during the past decade, is also throwing an increasing share of repair work on the engineering side of the dockyards, and necessitating an increase in the numbers of men therein employed, though no corresponding increase is required on the constructive side at present. Although no important re-constructive work is contem-

Home. plated, many minor but very important alterations are being carried out gradually with the object of improving the general fighting efficiency of the Fleet. Wireless telegraphy is being adopted in most of the later destroyers, and the improvements in the system adopted in our big ships have required constructive alterations in them to enable the instruments to be fitted. These alterations require considerable time and money to carry out, in view of the great number of vessels involved.

Excellent work continues to be done by repair-ships, and the artificers of the Fleet, in correcting small defects which might otherwise develop to such an extent as to necessitate dockyard assistance before the annual refit was due; but nevertheless, for the reasons I have given above, an increased provision of £700,000 for repairs is needed for the coming year.

We have begun to build submarines in the Royal Dockyards, a step which, besides affording desirable work to them, will be a check on contract prices.

The Admiralty have come to an arrangement with the armour-plate manufacturers for a considerable reduction in the price which is paid for armour-plates, and this will take effect in the construction of the new armoured-ships of the current year's programme.

General Progress of Recent Reforms.

A review of the memoranda issued by the Admiralty during the last few years discloses a series of important changes and alterations affecting all branches of His Majesty's Naval Service. These are all, in my opinion, entirely well conceived and salutary. Time is now required for the Service to digest and assimilate the new arrangements, and caution will, therefore, be used in bringing forward further schemes at present.

Under the nucleus crew system, the chief executive officers and more important ratings are always on board the ships; from time to time the crews are made up to full complement, and are given seagoing practice; the boilers and machinery are always maintained in good order, so as to be ready for sudden mobilisation.

The rapidity and certainty with which the nucleus crew ships can be fully manned has been illustrated signally by the recent exercises of mobilisation at Devonport, Portsmouth, and Chatham.

It has been alleged that the Admiralty have no war plans properly worked out, nor strategical operations thoroughly elaborated; this is a baseless allegation. Such plans are in the possession of the Admiralty in abundant number to meet all probable emergencies. The details of these plans cannot, of course, be made public, for their successful operation in actual warfare must largely depend upon their secrecy.

The new disposition of the Atlantic Fleet, with its base at Berehaven, and its repairing dockyard at Gibraltar, and the development of the Home Fleet, have been notable examples of the progress of the last two years. The fully manned portion of this Fleet at present has its base at the Nore, and is now in full working order, though not yet up to its intended full strength. It will consist this summer of twelve of the latest battleships and armoured cruisers, with destroyer and submarine flotillas attached, and the nucleus crew ships at the three Home Ports ready for rapid mobilisation.

The remarkable results which have, during the last year, been returned of the gunnery practice carried out by our Fleets and ships all over the

world, are facts of great interest and worthy of congratulation.

Home. The reports of the efficiency, which signalling has reached in the Naval Service, whether by the older systems or by electric and wireless telegraphic installations, are very satisfactory, and speak very highly for the intelligence and hard work of the officers and men who take charge of this important part of the service of the sea.

The new system of entry, training, and education for all classes of officers in the Navy—executive, engineers, and marines—instituted a little more than four years ago, is yielding good results. The first two batches of Cadets are now serving in the training cruisers "Cumberland" and "Cornwall."

After six months' service in these cruisers, they will be drafted to ships in the seagoing fleets, the first batch going to sea in April. In the fleets they will be trained in a practical way as Naval officers, and after three years they will be examined in Seamanship, Navigation, and Pilotage, Gunnery, Torpedo, and Engineering, and in certain optional subjects, such as Mathematics, Mechanics, Electricity, Languages, and History, the study of which at sea will be voluntary. After passing the examinations in the above subjects, they will become Sub-Lieutenants, and remain at sea, receiving their promotion to Lieutenant according to the results of their examination. After serving at least two years at sea as Sub-Lieutenant and Lieutenant, a certain proportion will be selected to qualify in the separate specialist branches of the Service, in preparation for which they will then undergo courses at the Royal Naval College, Greenwich, and the specialist schools.

The officers will thus serve for 5½ years continuously at sea before they can specialise.

The Interview Committees which, since taking office, I have appointed to report on the respective qualifications of the candidates for entry as Naval Cadets, have included Admirals of the Fleet Lord Walter Kerr and Sir Edward Seymour, Admirals Sir Archibald Douglas, and Sir Arthur Fanshawe, Vice-Admiral Sir John Durnford, the Right Hon. Arthur Acland, Mr. A. C. Benson, and the Headmasters of Marlborough, Wellington, Radley and Dartmouth. Their reports to me have revealed a most satisfactory unanimity of opinion as to the value and success of this method of differentiating between the merits of boys of the young age of twelve years.

Works.

After negotiations extending over a good many months, a site has been feued on the west shore of Loch Long for the establishment of a Torpedo Range of 7,000 yards length, and another has been purchased at Greenock for a Torpedo Factory, whence these weapons can readily be conveyed to the range for trial. The rapid increase in recent years of the speed and the range of action of the Whitehead Torpedo has rendered the existing ranges at Portsmouth and Weymouth wholly inadequate for their purpose, and a thorough survey of the coasts of the United Kingdom resulted in the selection of Loch Long as the place which would best comply with all the new conditions required. Visitors to this part of Scotland need be under no apprehension that the beauties of the scenery or the convenience of access will be interfered with.

The Admiralty property at Rosyth, consisting of 1,184 1-5 acres, with 285 acres of foreshore, was purchased in 1903-04 for the construction of a new Naval base on the east coast. In the interval since the completion of

the purchase, the Superintending Engineer appointed in charge of Rosyth has made an extensive survey of all the great Naval establishments and building yards at home and of some abroad, in order that plans might be drawn for the laying out of Rosyth as a first-class Naval base in such a way that any particular portion might be carried out without interference with the general scheme; the intention was to avoid the repetition of the haphazard growth of a Naval dockyard port, which the history of the old establishments at Portsmouth, Devonport, and Chatham, has proved to be so expensive in the past. The general scheme having been drawn up, the present Board of Admiralty have decided to take in hand the construction of a graving dock, closed basin, and an entrance lock, capable of accommodating the largest modern war-ships, with a depôt for submarines and destroyers, and provision for oil fuel storage. The basin is to be 52½ acres in area, with accommodation for 11 of the largest ships along the quays, or 22 when double banked.

Home.

During the past year the preliminary borings have been completed, and detailed contract plans are now being prepared.

This part of the general scheme, for which the contract will shortly be let, is estimated to cost £3,000,000 for work and £250,000 for machinery—the whole to be completed in about ten years.

The necessity for this work is apparent when it is remembered that there is no Government dockyard capable of taking ships of the "Dreadnought" class along the whole of the east coast of Great Britain.

Distribution of the Fleet.

The distribution of the Fleet has undergone no material alteration. The development of the Home Fleet is steadily proceeding and by degrees approaching its desired standard of strength.

In August last two armoured cruisers were added to the First Cruiser Squadron, and 24 destroyers, forming a "Western Group" based on Portland, were placed permanently under the orders of the Commander-in-Chief of the Channel Fleet. More recently six nucleus crew destroyers have been added to this group, with the object of forming a reserve at Portland, and so rendering the group as far as possible self-contained.

The Channel Fleet has had its quota of destroyers brought up to thirty, and the Battle Squadron is being strengthened by the substitution of six of the "Bulwark" type for older vessels, so that it will in future consist of eight "King Edwards" and six "Bulwarks."

It has recently been decided to appropriate permanently the "Shearwater" and "Algerine" for service on the West Coast of America, the "Algerine" being transferred from the China Station. These two vessels will be available for the Behring Sea Patrol and also for occasional visits to the Pacific Isands.

An inter-departmental Conference, under the presidency of Vice-Admiral Sir Reginald Henderson, commanding the Coast Guard and Reserves, has been sitting to consider the general question of the protection to be afforded by the Navy to the fishery interests in the seas surrounding the British Isles, which involves also the question of Revenue protection afloat.

I append the usual statement of work done in the Department.

11th February, 1908. TWEEDMOUTH.

Votes.		Estimates, 1908-1909. Gross Estimate.	Appropriations in Aid.	Net Estimate.	Estimates, 1907-1908. Gross Estimate.	Appropriations in Aid.	Net Estimate.	Difference on Net Estimates. Increase.	Decrease.	Votes.
	I.—Numbers.									
A	Total number of Officers, Seamen, Boys, Coastguard, and Royal Marines	128,000	—	Total Numbers. 128,000	128,000	—	Total Numbers. 128,000	Numbers. —	Numbers. —	A.
	II.—Effective Services.	£	£	£	£	£	£	£	£	
1	Wages, etc., of Officers, Seamen, and Boys, Coastguard, and Royal Marines	7,266,217	136,517	7,129,700	7,006,412	136,712	6,869,700	260,000	—	1
2	Victualling and Clothing for the Navy	2,862,071	575,671	2,286,400	2,441,217	444,817	1,996,400	290,000	—	2
3	Medical Establishments and Services	278,962	20,262	258,700	287,856	19,156	268,700	—	10,000	3
4	Martial Law	14,000	100	13,900	14,295	95	14,200	—	300	4
5	Educational Services	230,441	63,441	167,000	236,831	64,331	172,500	—	5,500	5
6	Scientific Services	95,195	29,195	66,000	90,280	25,180	65,100	900	—	6
7	Royal Naval Reserves	376,584	8,284	368,300	426,518	8,218	418,300	—	50,000	7
8	Shipbuilding, Repairs, Maintenance, etc.:—									8
	Section I.—Personnel	2,958,000	21,800	2,936,200	2,571,700	21,800	2,549,900	386,300	—	Sec. I.
	Section II.—Matériel	4,539,000	382,000	4,157,000	3,420,200	385,000	3,035,200	1,121,800	—	Sec. II.
	Section III.—Contract Work	7,357,700	137,000	7,220,700	7,783,000	137,000	7,646,000	—	425,300	Sec. III.
9	Naval Armaments	2,208,700	160,000	2,048,700	2,508,700	160,000	2,348,700	—	300,000	9
10	Works, Buildings, and Repairs at Home and Abroad	2,340,700	34,000	2,306,700	2,792,400	34,000	2,758,400	—	451,700	10
11	Miscellaneous Effective Services	421,607	12,407	409,200	414,437	13,437	401,000	8,200	—	11
12	Admiralty Office	378,975	8,775	370,200	373,350	8,750	364,600	5,600	—	12
	Total Effective Services ... ... £	31,328,152	1,589,452	29,738,700	30,367,196	1,458,496	28,908,700	2,072,800	1,242,800	
	III.—Non-Effective Services.									
13	Half Pay and Retired Pay...	881,618	12,818	868,800	850,775	12,875	837,900	30,900	—	13
14	Naval and Marine Pensions, Gratuities, and Compassionate Allowances	1,354,393	19,793	1,334,600	1,321,745	19,745	1,302,000	32,600	—	14
15	Civil Pensions and Gratuities	377,840	440	377,400	371,330	430	370,900	6,500	—	15
	Total Non-Effective Services ... ... £	2,613,851	33,051	2,580,800	2,543,850	33,050	2,510,800	70,000	—	
	Grand Total ... ... £	33,942,003	1,622,503	32,319,500	32,911,046	1,491,546	31,419,500	2,142,800	1,242,800	
							Net Increase			£900,000

NOTE.—Provision to the extent of £390,661 is included in the Estimates for 1908-1909 under Votes 8, 10 and 12, for the continuation of services provided for prior to 1st April, 1907, out of funds raised under the authority of the Naval Works Acts, 1895 to 1905.

In addition to the Cash expenditure, stock of Stores purchased in previous years will be drawn upon without replacement to the extent of £500,150 (estimated).

Admiralty, 29th January, 1908. } TWEEDMOUTH. J. A. FISHER. W. H. MAY. H. B. JACKSON. L. WINSLOE. GEORGE LAMBERT. EDMUND ROBERTSON, Secretary.

Home.

STATEMENT showing the Gross Expenditure on Naval Services for the years 1904-1905 to 1906-1907, together with the Estimated Gross Expenditure for 1907-1908 and 1908-1909.

—	Actual Expenditure.			Estimtd. Expenditure.	
	1904-1905.	1905-1906.	1906-1907.	1907-1908.	1908-1909.
	£	£	£	£	£
Gross Expenditure (Navy Vote)	38,293,738	34,861,443	33,262,649	32,911,046	33,942,003
Abate: Annuity under the Naval Works Acts, 1895 to 1905	634,238	1,015,812	1,094,309	1,214,402	1,264,032
	37,659,500	33,845,631	32,168,340	31,696,644	32,677,971
Expenditure from Loans ...	3,402,575	3,313,604	2,431,201	1,135,000	896,925
Value of Stores drawn from stock, without replacement, in aid of cash expenditure	—	768,850	1,024,200	1,241,800	500,150
Expenditure on behalf of Naval Services from Votes of other Departments	373,686	372,695	354,084	370,360	382,742
Total ... ... £	41,435,761	38,300,780	35,977,825	34,443,804	34,457,788

STATEMENT showing the Net Expenditure from Naval Votes and Loans on account of Naval Services for the Years 1901-2 *to* 1906-7, *together with the Estimates for* 1907-8 *and* 1908-9.

Year.	Total Expenditure from Naval Votes (Net).	Annuity in Repayment of Loans under the Naval Works Acts.	Total Expenditure exclusive of Annuity. [Column (2) deducted from Column (1).]	Expenditure from Loans under Naval Works Acts.	Total of Columns (3) and (4)	Expenditure on New Construction (Vote 8).
	(1)	(2)	(3)	(4)	(5)	(6)
	£	£	£	£	£	£
1901-2 - -	30,981,315	122,255	30,859,060	2,745,176	33,604,236	8,865,080
1902-3 - -	31,003,977	297,895	30,706,082	3,198,017	33,904,099	8,534,917
1903-4 - -	35,709,477	502,010	35,207,467	3,261,083	38,468,550	11,115,733
1904-5 - -	36,859,681	634,238	36,225,443	3,402,575	39,628,018	11,263,019
1905-6 - -	33,151,841	1,015,812	32,136,029	3,313,604	35,449,633	9,688,044
1906-7 - -	31,472,087	1,094,309	30,377,778	2,431,201	32,808,979	8,861,897
1907-8 - - (estimated)	31,419,500	1,214,402	30,205,098	1,135,000	31,340,098	8,100,000
1908-9 - - (estimated)	32,319,500	1,264,032	31,055,468	896,925	31,952,393	7,545,202

France. The following are the principal promotions and appointments which have been made:—Vice-Admiral—M. P. E. De Fauque de Jonquières to be Member of the Superior Council of the Navy and Permanent Inspector-General of Torpedo and Submarine Flotillas. Rear-Admirals—P. A. Campion to be Vice-Admiral; J. C. L. Gaschard to be Director of Superior School of the Navy; F. P. Arago to be Commander-in-Chief of the Naval Division of Algeria; P. G. Forestier for service at Toulon Dockyard; H. De Faubournet de Montferrand to be Chief of the Staff of the 5th *Arrondissement Maritime* (Toulon). Capitaines de Vaisseau—H. De Faubournet de Montferrand to be Rear-Admiral; E. J. Aubry to "Condé." Capitaines de Frégate—M. J. Courroux, A. H. Nissen, L. E. Sagot-Duvauroux to be Capitaines de Vaisseau; H. Salaün to "Bombarde" and Command of Destroyer Flotilla of the Squadron of the North; B. A. Crova du Marigot to Command of Naval Division of Senegal; M. J. Delahet to "Galilée."—*Journal Officiel de la République Française.*

Capitaine de Frégate Tisard, of the "Galilée," in Moroccan waters, is returning to France invalided. It is reported, however, that there are other reasons for his departure, which may be due to the fact that on hearing a quarter-master transmit a wrong order through a speaking-tube he gave way to what is called "un mouvement de vivacité," in consequence of which the man's face was somewhat injured by coming into violent contact with the voice-pipe, causing him to lay a complaint against his captain. One cannot help thinking how much more satisfactorily Rudyard Kipling settled a similar difficulty in his clever story, "His Private Honour."

Launches.—The new first-class armoured cruiser "Waldeck Rousseau" was launched on the 3rd inst. from the dockyard at Lorient. Her dimensions are as follows:—Length, 528 feet; beam, 70 feet 4 inches; draught, 27 feet 6 inches, with a displacement of 14,000 tons. Her engines are to develop 36,000-I.H.P., to give a speed of 23 knots; her boilers being of the "Niclausse" water-tube type. Protection is afforded by a complete belt of hardened steel, 6·7-inch tapering to 3·6-inch, with an upper belt of 5-inch steel, tapering to 2·2-inch. The double turrets are protected by 7·8-inch armour, the turrets for the single guns by 5-inch, the casemates with 4-inch.

Her armament consists of fourteen 7·6-inch Q.F. guns (1902 model), four in pairs in turrets, fore and aft; two in single turrets amidships; six in casemates. Fourteen 6-pounder Q.F. guns (1902 model); eight 3-pounder Q.F. guns and two submerged torpedo tubes. Her normal coal capacity is 1,500 tons, with a total stowage on an emergency of 2,300 tons, giving her a radius of action of 11,000 miles at ten knots speed. The vessel is to be completed in 1910.

The destroyer "Hache" was launched at Toulon on 15th February. She is 336 tons displacement and 6,800-H.P., and her estimated speed is 28 knots.

Boiler Accidents on board the "Jeanne d'Arc" and "Descartes."—A wireless message has been received from Rear-Admiral Philibert reporting a serious boiler accident on board the armoured cruiser "Jeanne d'Arc," off Rabat, by which fourteen men have been seriously injured. Her boilers, which were built by the Indret firm, have all along given difficulty. A later message reports that she proceeded to Gibraltar and landed the injured men for treatment at the English naval hospital. Four of the injured men have since died there and were buried with full naval and military honours. The funeral procession was led by the band of the

France. English battle-ship "Duncan," followed by a party of seamen; then came naval field-pieces, drawn by their gun's crews, bearing the coffins, covered with the French ensign and many wreaths, sent from the English ships present. The pall-bearers were French sailors. Bands of the different regiments were also present to play the funeral march, and the procession was closed by detachments from the garrison and by officers representing the different corps and ships. M. Thomson, Minister of Marine, has since ordered the four coffins to be exhumed, and they have been transported to France in the "Jeanne d'Arc," which has since arrived at Brest. The injured men still in hospital at Gibraltar are said to be progressing favourably. The accident is said to have been caused by the rupture of a steam-pipe valve.

News of another steam-pipe accident on board the second-class protected cruiser "Descartes" has also come to hand, by which several men have been injured, two of them fatally.

Discussion on the best type of Boiler in the Senate.—An interesting discussion has been raised in the Senate by M. Fleury-Ravarin, on the type of boiler to be supplied to the new battle-ships building. He alluded to the importance of selecting the very best type of boiler obtainable, and complained that though there were several kinds in the market the only firms asked to tender were the Delaunay-Belleville and the Niclausse establishments, and that practically a monopoly had been created in their favour. It is remarkable that, though at one time in favour of them, the English Admiralty has now decided not to order any more of the Belleville boilers, which fact is worthy of consideration.

There are certainly four other types of marine boilers made in France, the Du Temple-Guyot, Normand, Allest, and Babcock. The first, the invention of an officer in the French Navy, are well known. Those made by Messrs. Normand have been largely adopted for small vessels. The Allest boilers are of the large tube type, and have been supplied to several battle-ships; and the Babcock boilers, though a foreign invention, are made in France at the St. Denis works, and are largely used in the mercantile marine. Surely the boilers of some of these firms should be considered.

M. Louis Pichon said: The improvement that has in recent years taken place in marine boilers is well known. In the earliest days water was evaporated in a simple boiler, which differed little from an ordinary kitchen boiler. The next step was that introduced by Séguin, who invented the tubular boiler, the inflammable gases caused by combustion passing through tubes which greatly increased the evaporative power. Out of this in time came the present idea that of, in lieu of placing the water in the boiler surrounding the tubes, causing it to circulate in the tubes themselves, which are heated by the flames of the furnace. These water-tube boilers are of different construction, some have tubes of small diameter, others of large. In some the tubes are vertical, in others horizontal. M. Pelletan, in his circular, laid down the general principle that for large ships tubes of large diameter are advisable, and for small ships the smaller tube type of boiler. But there is really no just foundation for this opinion, though it has, none the less, been generally followed in our Navy, and has contributed not a little to create the situation which M. Fleury-Ravarin complains of, as that it has come to pass that of late nearly all our orders have been given to two firms without a proper competition, and to the prejudice of the finances of the State.

The views of other countries on this boiler question are briefly as follows: England, Germany and Japan consider the unification of a single

France. type of boiler advisable for all ships as far as possible. Germany and Japan give preference to boilers of the vertical tube type. The English Admiralty, for various reasons, continues partly to employ the horizontal-tube boiler, but the tendency is now in favour of vertical tubes as being the most suitable for employment with turbine machinery. Two-thirds of the new battle-ships and cruisers now building by England, Germany, and America are to have this boiler, which it may be said will be represented in new ships of 117,000 tons and 300,000-H.P., equal to 69 per cent. of the tonnage, and 73 per cent. of the H.P. of the ships now under construction abroad. This is an object lesson to us which cannot be neglected, and if we do not follow the movement of our rivals, we may soon be left still further behind them than we are at present.

Admiral de Cuverville thought it too early yet to say whether the Babcock and Willcox type of boiler was superior to the others. The future only will show this, and he urged that all latitude should be given to the Minister of Marine to deal with the matter, and that in any case it would be a mistake to delay the completion of the battle-ships of the "Danton" class.

M. Thomson, Minister of Marine thanked Admiral de Cuverville for his support. The boiler question is a complicated one. Belleville boilers had been adopted for the first of the new battle-ships, and Niclausse boilers for the second. He knew that a foreign boiler was well spoken of, and the Ministry were quite willing to adopt any type of boiler, no matter where it came from, if it could be proved to be the best; but all other things being equal, preference would be given to a French boiler, and as far as he could ascertain the Babcock boiler had not proved to be superior and was 30 per cent. heavier than the French boilers, and the Commission appointed to examine the question have come to the conclusion that on this account it would not be possible to put this boiler into the battle-ships of the "Danton" class. In any case, however, the decision has now been taken, and it would be a mistake to alter it, for all the plans being now prepared, great delay would ensue. He hoped the Senate would believe that the pecuniary interests of the State had not been neglected, and that the decision arrived at is the right one, and he concluded by imploring it not to order a further enquiry, which would only have the effect of delaying the completion of the six new battle-ships.—*Le Temps*, *La Vie Maritime*, and *Le Yacht*.

MILITARY NOTES.

Home. The following are the principal appointments which have been made:—

Lieut.-General—J. P. C. Glyn, to be Colonel-Commandant of the Rifle Brigade (The Prince Consort's Own).

Major-Generals—Sir C. B. Knowles, K.C.B., to be Colonel of the Hampshire Regiment.

Colonels—F. Hammersley, from h.p., to be a Brigadier-General to command an Infantry Brigade, and is granted the temporary rank of Brigadier-General whilst so employed. F. J. Davies, C.B., from an A.Q.M.G., to be a General Staff Officer, 1st Grade. W. Adye, a General Staff Officer, 2nd Grade at Headquarters, is promoted to 1st Grade. G. D. Collings, D.S.O., to be Chief Paymaster, with the rank of Colonel.

Home. A. J. Abdy, from h.p., to be Commander of the R.H. and R.F.A. in South Africa. F. C. A. Gilpin to be an A.Q.M.G. F. W. P. Angelo, I.A., to be a Colonel on the Staff, and is granted the temporary rank of Brigadier-General. H. S. Dawkins to be an Inspector of Artillery, and is granted the temporary rank of Brigadier-General. W. E. Peyton, D.S.O., to be an A.Q.M.G. H. F. M. Wilson to be an A.A.G. A. W. G. L. Cole to be an A.A.G. W. P. Pulteney, C.B., D.S.O., from h.p., to be a Brigadier-General to command an Infantry Brigade. F. W. B. Landon, C.B., from charge of A.S.C. Records to be an Assistant Director of Supplies and Transport.

Memorandum of the Secretary of State Relating to the Army Estimates for 1908-09.—Total Estimates.—The total of the Army Estimates for the new financial year is £27,459,000, and compares with the totals for the three preceding years as follows :—

	£
1905-06	29,813,000
1906-07	29,796,000
1907-08	27,760,000
1908-09	27,459,000

showing a progressive reduction on the votes of £2,354,000.

The average expenditure under Army Loans for the three years ending with 1905-06 was £2,539,000

For the three years ending with 1908-09 it is not expected to exceed 430,000

giving a reduction in average annual expenditure of ... £2,109,000

There has thus been a reduction in votes and loans for military expenditure since 1905-06 of close upon 4¼ millions a year. The reduction effected in the actual expenditure under the votes is dealt with in another page.

The reduction actually made in the Estimates of 1908-09, as compared with those of 1907-08, is £301,000. To make this reduction, and at the same time to find £625,000 within the reduced total, for the special charges detailed below, I have had to effect economies amounting in all to £926,000 :—

	£
Initial charges of the Territorial Force	300,000
Bonus to Militiamen transferring to the Special Reserve	80,000
Increase of the vote for works, owing to the closing of loan expenditure	79,000
	459,000

as well as for the continued growth of the following charges :—

Pensions	96,000
Army Reserve	70,000
	£625,000

There is also a reduction of 5,000 in the number of men to be voted. This does not include the reduction which will result from the intended withdrawal, in the course of 1908-09, of a cavalry regiment and four infantry battalions from South Africa, as explained elsewhere.

Home. (The Secretary of State for War then points out that military expenditure cannot be profitably considered apart from military policy, and explains that as large and sudden reductions would only provoke reaction and prove disappointing in their results, the policy of the Government has been to proceed cautiously, if steadily, in the endeavour to reduce cost. He proceeds to refer to the changes in military policy introduced in 1892, and describes the nature and aim of the Cardwell reforms and the development of the Cardwell system attempted by the Government during the past two years, and arrives at the conclusion that in a steady development on really scientific lines of the organisation of the Regular Army, of the Special Reserve, and of the Territorial Force, and in a rigid application wherever possible of the policy of concentration, lies the best hope of economy for the future.)

Establishment of the Regular Army.

The total of Vote A shows a decrease of 5,000 as compared with 1907-08, of which 1,900 arises from reduction of the supernumeraries resulting from the recent reduction of the Army. The other principal causes of the decrease are a reduction of 1,000 men in the Garrison Artillery (a further result of the revision of coast defences by the Joint Naval and Military Committee under Sir J. F. Owen), the return to India of one of the native Indian battalions from North China, and a reduction in the permanent staff of Militia units on the reorganisation of that force.

I explained in my Memorandum of last year that in order to supply the present deficiency of trained *personnel* for ammunition columns on mobilisation, 33 batteries of Field Artillery, surplus to the requirements of the Expeditionary Force, would be converted into Training Brigades, to train Special Reservists for the purpose. The establishments of these field batteries have been reduced by some 2,200 men, and those of the batteries in South Africa by some 200 men, on reduction to a 4-gun basis; but the 2,400 men thus set free are temporarily retained on the establishment, in accordance with the policy indicated in my Memorandum of last year, until Special Reservists have been trained to replace them.

Militia and Special Reserve.

In accordance with the announcements made during the Session of 1907, arrangements have been made for the disbandment of 23 battalions of Militia infantry; but with this exception all Militia units will train during 1908 as in 1907. At the end of the training they will be converted into units of the Special Reserve, with the exception of the Militia Medical Corps, which will be disbanded, as the Special Reservists required to expand the *personnel* of the Regular Medical Corps in war will be trained with the Territorial Force. Of the 101 remaining battalions of Infantry Militia to be converted to Special Reserve battalions, 70 will be amalgamated with the existing depôts of Line regiments, and will drill both Line and Special Reserve recruits; 4 will form a depôt for Special Reserves of rifle regiments, and 27 will form Extra Reserve battalions.

Recruiting for the Special Reserve units began on 16th January, 1908.

Territorial Force—Progress Made.

The Territorial and Reserve Forces Act, 1907, provides for the formation of the Territorial Force and for the establishment of County

Home. Associations in connection with it. This force will not come into existence until the end of the present financial year, but in the meanwhile preparations are being actively pressed forward to met the changes for which the Act calls.

The first thing that had to be done was to set up the necessary machinery for the working of the new Act, and all the 93 County Associations required in Great Britain were incorporated before the end of January. A draft scheme drawn up by the General Staff, giving in detail the numbers and the nature of the troops which each county is to be asked to provide, has been laid before the Associations. They are at present engaged, with the assistance of the military authorities of the several Commands, in effecting such adjustments in it as, while not disturbing the total number of troops which each district is intended to provide, may be necessary to suit the capabilities of each county to raise the men. They are also being supplied with instructions regarding the financial arrangements of the new Force; regulations for the clothing of it are also about to be issued (funds will be supplied for two suits per man), and everything is being done to make the Associations familiar with the new duties which they will assume at the commencement of the coming financial year.

Side by side with this, the military organisation of the Force is being advanced. Divisional Commanders have been appointed to the fourteen divisions of the Territorial Force, and the appointments of the brigadiers and officers commanding artillery formations and their staff officers will be made shortly, as will those of the staffs of the Divisional Commanders. Provisional establishments for all branches of the Force have been laid down, and a scheme for training, setting forth the amount of training that will be required from the various arms under Clause 15 of the Act has been drawn up. A pamphlet embodying the provisions of this scheme is ready for issue.

A form of attestation, to which every recruit on joining the Force will have to subscribe, has been prepared. This is necessary to meet statutory requirements. The terms of service, of extension of service, of re-engagement, and of resignation, have been drawn up. The scales of pay and of allowances have also been settled. The regulations for the Territorial Force, which are to take the place of the Yeomanry and Volunteer regulations, are being drawn up.

With regard to *matériel*, the most important requirement is the guns for the new Horse and Field Artillery. The 15-pounder guns just given up by the Regular Army are being converted and mounted upon Q.F. carriages, and are being now delivered at the rate of two batteries a week. It is intended to convert altogether 536 of these guns, sufficient to equip 134 batteries of four guns. The 56—4·7-inch Q.F. guns for the heavy batteries are already in the possession of the Volunteers. Mountain guns will shortly be available; also howitzers, as soon as the Regular howitzer batteries are re-armed. Ample stocks of ammunition are in store. A large amount of harness and other equipment for the Artillery is also ready for issue.

More than half the machine guns for the Territorial Force are already in possession of Yeomanry and Volunteer units. All the rest are ready for issue. Short rifles to re-equip the Yeomanry are ready and will be issued as soon as accoutrements (to take ammunition in chargers) have been supplied. The Lee-Enfield rifle is also under conversion to charger loading, and large numbers will soon be available for issue to the Territorial Force.

Home. Finally, the Auxiliary Forces Department at the War Office has been reorganised. It will in future be known as the Territorial Forces Department, under a Director-General of the Territorial Force, and the department is placed directly under the Secretary of State.

Financial Provision for 1908-09.

In the Vote for Territorial Forces (Vote 4), a special sum of £300,000 is included for initial charges in respect of clothing and equipment, to place the County Associations in a thoroughly sound financial position from the beginning, and enable them to conduct their administration without recourse to credit. I have also made what I hope is an adequate provision for the expenses of the Associations, over and above the former cost of the Yeomanry and Volunteers, the total of Vote 4 for 1908-09 standing no less than £443,000 above the combined totals of Votes 4 and 5 for 1907-08.

In addition to this, other sums for the initial equipment of the new Force are included in the Estimates which, with the two sums of £439,000 and £350,000 for extinction of debt taken out of savings by the Supplementary Estimates of 1906-07 and 1907-08, bring the total provision for expenditure of a capital nature in starting the Territorial Force to about £1,250,000.

Re-arrangement of Votes.

In consequence of the union of the Imperial Yeomanry and the Volunteers to form the Territorial Force, the number of Army Votes is reduced by one, to 15. To minimise the disturbance of the familiar numbers of the Votes, the Vote for Educational Establishments (formerly Vote 11) is inserted in the vacant place as Vote 5, that being also the place held by the Educational Vote in the Navy Estimates. The form of the Votes for the new Forces (Votes 3 and 4) is specially designed to suit the needs of the year of transition, and will be simplified in the next Estimates. These arrangements have been approved by the Treasury.

Loan Annuities.

It will be seen, on reference to Vote 10, that there is no increase this year in the repayments under the Barracks and Military Works Acts. The expenditure under the Military Works Loan in 1907 involves the creation of an annuity of some £35,000; but owing to the fact that the necessary money was not borrowed until 1908, the first charge in respect of the annuity falls on the Estimates of 1909-10.

Pensions.

The growth of the non-effective Votes continues, and the increase in 1908-09 is no less than £96,000. Of this some £30,000 is due to the normal growth of the charge for officers' retired pay, and the rest to the growth of Chelsea pensions. This latter increase arises to a large extent from the discharge to pension of abnormal numbers of non-commissioned officers and men in consequence of the reduction of the Army and of the permanent staff of the Militia; but apart from this special increase (which is, of course, more than balanced by the saving on pay) the ceaseless growth of pension charges, to be met from a reduced total of Army Votes, and with constant pressure in the direction of increased scales for this or that class of pensioner, gives rise to considerable apprehension of future difficulties.

February, 1908. R. B. H.

Home.

Abstract of Army Estimates.

The detailed Army Estimates for the year 1908-09 have been issued as a Parliamentary paper, which contains an abstract, arranged under the various votes, of which the following are the most important figures :—

Nos.—Votes.	——	Net Estimate. 1908-9.	Nos.—Votes.	Net Estimate. 1907-8.	Increase on net Estimates.	Decrease on net Estimates
	I.—Numbers.	Total Numbers.		Total Numbers.	Numbers.	Numbers.
A	Number of Men on the Home and Colonial Establishments of the Army, exclusive of those serving in India	185,000	A	190,000	—	5,000
	II.—Effective Services.	£		£	£	£
1	Pay, etc., of the Army ...	9,422,000	1	9,835,000	—	413,000
2	Medical Establishment :— Pay, etc.	451,000	2	460,000	—	9,000
3	Special Reserves and Militia	840,000	3	840,000	—	—
4	Territorial Forces	2,005,000	4 5	410,000 1,152,000	443,000	—
5	Establishments for Military Education	142,000	11	137,000	5,000	—
6	Quartering, Transport, and Remounts...	1,839,000	6	1,909,000	—	70,000
7	Supplies and Clothing ...	8,912,000	7	4,060,000	—	148,000
8	Ordnance Department Establishments and General stores	498,000	8	620,000	—	122,000
9	Armaments and Engineer Stores	1,490,000	9	1,671,000	—	181,000
10	Works and Buildings ...	2,515,000	10	12,436,000	79,000	—
11	Miscellaneous Effective Services	73,000	12	67,000	6,000	—
12	War Office and Army Accounts Department ...	580,000	13	567,000	13,000	—
	Total Effective Services	23,767,000		24,164,000	546,000	943,000
	III.—Non-Effective Services.					
13	Non-Effective Charges for Officers, etc.	1,743,000	14	1,714,000	29,000	—
14	Non-Effective Charges for Men, etc.	1,783,000	15	1,709,000	73,000	—
15	Civil Superannuation, Compensation, and Compassionate Allowances ...	167,000	16	173,000	—	6,000
	Total Non-Effective Services	3,692,000		3,596,000	102,000	6,000
	Total Effective and Non-Effective Services ...	(a) 27,459,000		27,760,000	648,000	949,000
	Net Decrease			.. ..	... ...	£301,000

(*a*) In consequence of certain transfers, the Army Estimates are less by £18,200 than they would otherwise have been, viz. (i) £7,500 transferred to Navy Estimates in respect of half the cost of *personnel* of the Ordnance Board and Research Department (mainly Vote 9); £10,700 (net) transferred to Civil Service Estimates in respect of Ordnance Survey Services, Civil Votes bearing the pay, etc., of Survey Companies R.E., engaged in Ordnance Survey work (Votes 1 and 7), and repayment being made from Army Estimates for the cost of work done for the Army (Vote 11).

Home.

Repayments by Government of India, included as Appropriations in Aid of Army Estimates; other than Stores, etc., issued on Repayment.	1908-9.	1907-8.
	£	£
To meet the Expenditure for Raising and Training Recruits for India	568,200	566,700
For Deferred Pay and Gratuities for Service on the Indian Establishment	87,000	92,000
For Non-Effective Services of the European Army serving in India	999,530	967,170
	1,654,730	1,625,870
Deduct—Contribution from Army Funds towards Cost of Garrison of Aden and Sea Transport	230,000	230,000
	£1,424,730	£1,395,870

R. B. HALDANE.
PORTSMOUTH.
T. R. BUCHANAN.
N. G. LYTTELTON, C.G.S.
C. W. DOUGLAS, A.G.
W. G. NICHOLSON, Q.M.G.
C. F. HADDEN, M.G.O.

E. W. D. WARD, *Secretary.*

War Office, 13th February, 1908.

China.

The Manœuvres of 1907.—The *Militär-Wochenblatt* has published a fairly detailed account of the last Chinese manœuvres. The following is a *précis* of its remarks on the training of the troops :—

Combined Tactics of the Different Arms.—The preparation of orders was entrusted to the Japanese officers who were present as instructors with the staffs. The division and brigade commanders remained too close to the fighting line, occupying themselves with trifles and taking no part in the direction of the troops. They have still but little comprehension of the employment of the different arms. On both sides an attempt was noticeable to arrive at a decisive result by means of an enveloping movement on the enemy's flank. The side on the defensive endeavoured to pass to the offensive.

Infantry.—The movements and changes of formation of this arm were rapidly and methodically carried out. The tendency to avoid the use of dense formations was manifest, but was not always realised. The advance of the skirmishers was conducted, according to the distance from the enemy, either at a walk or by rushes. The attacking line of skirmishers was very rapidly reinforced. The rushes were most frequently carried out by large units, often without the necessary fire support. Good use was made of the ground. There was a great deal of volley firing at long ranges. The officers stuck to the exact letter of the orders received, and were but little prepared to act with initiative and to estimate the changes of the tactical situation. The supply of ammunition during the fight was practised.

Cavalry.—The movements of the troops were good; the scouting was ineffective. There was a cavalry attack on the 23rd October which was a pretty and picturesque spectacle for people who know nothing about military matters.

Artillery.—This arm was judiciously employed. The distribution and the conduct of fire were good. This later, even in fights of long duration,

China. was correctly executed. The movements were generally carried out at a walk owing to the heavy nature of the manœuvre ground.

Technical Troops.—With the exception of the construction of some bridges and of improving the roads, the pioneers were mostly employed as artillery supports.

Transport.—Infantry, artillery, and supply columns as well as medical trains were formed. The wagons were those of the country, drawn by four mules or horses (three in shafts and one in front). The tents, too, were carried in the wagons. The order of the transport was satisfactory.

Medical Service.—At the commencement of an action each company detached four stretcher-bearers. Each division established, on the battle-field and at three or four kilometres from the front, three dressing stations and four field hospitals. The independent brigade established one dressing station and two field hospitals. The military surgeons came from the two medical schools at Tientsin, the one directed by two Frenchmen and the other by a Japanese.

Veterinary Service.—A remount depôt received sick horses and carried out the work of supply.

Prevosts.—225 policemen from the Gendarmerie Corps formed at Teintsin carried out this service.

Halting Places and Rations.—As a rule the men bivouacked in the tents carried in the wagons in order to maintain discipline and look after the population, which was very thick in the manœuvre area. The food supply was carried out before the commencement of the movements by the distribution of rice, beans, and millet by the supply columns.

Italy. *New Recruiting Regulations.*—During 1907 the Italian Government submitted a scheme for the approval of Parliament, the object of which was to establish the two years' period of service, to make the recruiting operations both quicker and less costly and to increase the annual contingent, which had become insufficient for the requirements of mobilisation.

The contingent, which formerly reached and sometimes exceeded 100,000 men, has considerably decreased and the 1885 (1905) class only furnished 75,000 men. This situation is due to emigration and to the numerous exemptions allowed by the law of the 6th August, 1888.

According to the terms of the new regulations the 2nd category, which formerly received the excess of the contingent (which no longer exists in fact), will receive a certain number of the exemptions which were formerly assigned to the 3rd category. The young men posted to the 2nd category will be permitted to remain in their homes, but are always liable to be called up for periods of training, lasting altogether from two to six months. This 2nd category will constitute a special supplementary reserve for the infantry. The young men attached to the 3rd category will be at once entered on the Territorial Militia lists and exempted from service in peace time.

The regulations assign to the 2nd category :—

1. The only son of a father aged at least 65 years.
2. The eldest son of a father aged at least 65 years and who has no other son of more than 12 years.
3. The only grandson of a man aged at least 70 years.

4. A man having a brother serving as a volunteer.

Italy.

5. A man who has a brother compulsorily retired as unfit, pensioned, or deceased in consequence of a wound, or infirmity contracted in the service, as long as the family has no other son assigned, for any reason, to the 2nd or 3rd categories.

The following are posted to the 3rd category :—

1. The eldest son of a father entered in his 65th year and who is infirm or legally absent.
2. The only son of a widow.
3. The only or eldest grandson of a man 70 years of age and who has no male children.
4. The only or eldest grandson of a widow who has no male children.
5. The eldest of orphans.
6. The only brother of orphaned sisters who are unmarried or widows, and who have no sons of more than 12 years.
7. A man whose brother, already serving with the colours, has renounced the privilege to which he was entitled of being posted to the 3rd category.
8. The youngest of orphans, whose other older brothers are infirm, imprisoned for at least 12 years, or legally absent.

Recognised natural sons enjoy the privilege of being posted to the 2nd or 3rd category when they fulfil the conditions mentioned above.

If two brothers are drawn to serve at the same time, one of them may be put back till the other has completed his period of service.—*Bulletin de la Presse et de la Bibliographie Militaires.*

Russia.

New Programme at the Infantry and Cavalry Military Schools. —As a result of the recent war a Commission has been charged with the revision, in a more practical sense, of the programme of studies at the Infantry and Cavalry Military Schools. On the suggestions of this Commission the following important changes have been introduced into the teaching at these establishments :

The course of theoretical tactics has been reduced in the second year so as to gain time for their practical application under the direction of the professors of tactics, artillery and fortification. This course will be based on modern campaigns and more especially on the late war, by laying special stress on the action of small detachments operating in conjunction with other troops.

The military history course has been extended and includes the recent campaign in Manchuria. The artillery and armament course will only deal with small arms, machine guns, ammunition, and the efficacy of fire. Instead of executing drawings of guns, gun carriages and material, which will be reserved for special artillery schools, the pupils of the infantry and cavalry will go and see the different models in armouries, and will visit the foundries and arsenals, where they will assist in the execution of firing under service conditions.

The fortification course will no longer include permanent fortification, nor the attack and the defence of fortified positions, but will deal solely with the use of hasty fortifications, special attention being paid to the tactical *rôle* and its application to the ground.

Russia. Greater weight will be given to the science of communications, viz., the construction of roads, bridges, and other means of passage, as well as to the use of the means of communication, such as telegraphy, heliography, carrier pigeons, balloons and motors. All these will be treated both theoretically and practically. In the cavalry schools the duties of mounted pioneers will be especially practised, and the course of demolition will be extended.

Topography will be reduced to freehand and sketches made by the aid of improvised instruments, to map reading (even foreign ones), and to the study of ground.

The theoretical course on the organisation of the Russian military forces will be completed by practical instruction dealing with administration and company and regimental accounts.

In the law course the pupils will be taught the proper measures for fighting the revolutionary and anti-military propaganda in the Army.

The programme of the Military Schools will also include geography and military hygiene, which has hitherto only been obligatory at the Junker Schools.

Finally, the teaching, not only of the national tongue, but also of foreign languages, especially German and French, will be developed.

It is also contemplated to increase to three years the duration of the course in the Infantry and Cavalry Military Schools, as is already the case in the Artillery, Engineer and Junker Schools.—*Bulletin de la Presse et Bibliographie Militaires.*

Switzerland. *New Infantry Drill Regulations.*—The new Swiss Infantry Drill Regulations do not differ essentially from the old ones. They confine themselves to defining, and in some cases accentuating the former ones. Certain formations, too, are simplified, and others, which have hitherto been regarded as intermediary between formations for the march and those of the fight, are abolished. Columns by the flank and the skirmishing line have become, so to speak, the only formations more or less recognised by regulations. The new regulations are divided into three parts, and are preceded by an introduction. The three parts are: 1st, Instruction; 2nd, The Fight; 3rd, Inspection and Ceremonial.

The first part constitutes the formal portion of the regulations. It lays down successively the rules for individual, section, company instruction, and finally that of the battalion and of larger units up to that of the brigade. The chapter on larger units is made as simple as possible. The three chapters dealing with individual section and company instruction form the framework of the regulations.

In individual instruction the pace is limited to three kinds: the cadenced step, the manœuvre step, and the gymnastic step. The sitting position has been added to the others when firing. In the manual the old slope has been reintroduced, with the difference that the rifle rests flat on the shoulder with the magazine turned outwards. Arms may be slung when at ease; but it is no longer a movement of the manual.

There is only one method of loading, that of the magazine. There is no alteration in passing from one formation to another. In the skirmishing line the interval between men is from one to two paces. If it is wished to occupy a more extended front, the intervals between groups or that between the men is increased.

Switzerland.

The company formations in close order are: line, company column, and marching formations. In changes of formation the company commander notifies the formation to be taken and the front or direction; if necessary he gives the order of the sections or their place. Sections move to their position in the new formation by the quickest route.

For the study of open formation the regulations are arranged as follows: To the chapter on individual instruction belongs the training of the soldier in the skirmishing line, the position he should take up, use of the ground, the employment of his weapon. The chapter on the section deals with rules for the conduct of fire; the chapter on the company, with tactical employment. Formal instruction ceases with the company school.

The battalion formations are the following: Line of columns, battalion column, march formations; for the regiment and the brigade there are no regulation formations.

One of the characteristics of the chapter on the fight is to no longer keep infantry isolated from the other arms. The regulations never forget that the fight includes the combination of the arms, their connection, and subordinates to this principle the directions they give to the infantry. They lay special stress on the advantages of the offensive, and explain what it is: The object of the battle is the destruction of the enemy. For this purpose fire is the principal mode of action; by movement one gets nearer to the enemy. The regulations insist on the necessity for the chief command to, above all, arrive at a decision and to pursue it without hesitation. They then study the phases of the fight, the breaking up of units, movements, fire, etc.

A chapter is devoted to the attack in general with a sub-chapter on the attack of fortified field positions. Then comes the defence, then the pursuit, the breaking off of action, the enforced retreat, and finally the attitude to be observed in the presence of cavalry and when under artillery and machine gun fire.

Part 3, dealing with inspections and ceremonial, call for no remarks. —*La Revue d'Infanterie.*

NAVAL AND MILITARY CALENDAR.

FEBRUARY, 1908.

1st (Sat.) H.M. Carlos, King of Portugal, and the Heir Apparent, were assassinated at Lisbon.

3rd (M.) 2nd Bn. Royal Inniskilling Fusiliers left Egypt for Ireland in the "Soudan."

6th (Th.) Kaid Sir Hector Maclean was released by Rasali.

9th (S.) H.M.S. "Bacchante" arrived at Nore from Mediterranean.

13th (Th.) A British Punitive Expedition, under Major-Gen. Sir J. Willcocks. K.C.M.G., was despatched to operate against the Zakka Khels.

" " 3rd Bn. King's Royal Rifles left England for Crete in the "Sicilia."

14th (F.) 2nd Bn. Royal Inniskilling Fusiliers arrived in Ireland from Egypt in the "Soudan."

17th (M.) H.M.S. "Bacchante" paid off at Chatham.

18th (T.) H.M.S. "Bacchante" recommissioned at Chatham for further term of service in the Mediterranean.

19th (W.) H.M.S. "Goliath" left Spithead for the Mediterranean.

20th (Th.) General Stössel was found guilty and sentenced to death for the surrender of Port Arthur in the Russo-Japanese War.

21st (F.) H.M.S. "Bacchante" left Sheerness for the Mediterranean.

24th (M.) 3rd Bn. King's Royal Rifles arrived in Crete from England in the "Sicilia."

26th (W.) A two days' armistice was granted to the Zakka Khels.

" " 1st Bn. Royal Inniskilling Fusiliers left Crete for Malta in the "Sicilia."

27th (Th.) 1st Bn. Connaught Rangers left Malta for India in the "Rewa."

28th (F) 1st Bn. Royal Inniskilling Fusiliers arrived in Malta from Crete in the "Sicilia."

" " An unsuccessful attempt was made to assassinate the Shah of Persia.

FOREIGN PERIODICALS.

NAVAL.

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Spain.—*Memorial de Ingeniéros del Ejército.* Madrid: January, 1908.—"The Gyroscope and its Use." "Ideas on the Actual State of Fortification on the Field of Battle" (*continued*). "The Automobile Service in Our Army." "Military Telegraphy: Optical Network in Spain."

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Revista Científico-Militar y Bibliotéca Militar. Barcelona: 10th February, 1908.—"Lessons for Cavalry Deduced from the Campaign in Manchuria." "Extempore Methods of Bridging" (*concluded*). "Modifications Introduced into the Maxim Machine Gun." 25th February.—"The Occupation of Mar Chica." "The Last Colonial Campaigns." "Remembrances of Germany." "The Art of Pulling the Trigger." "Field Artillery in Manchuria."

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NOTICES OF BOOKS.

Précis of Great Campaigns, 1796-1815. By J. H. Anderson. London: Hugh Rees, Ltd., 1907.

Since we have managed to some extent to free ourselves from the reiterated lessons of the Franco-German War of 1870, and those responsible for the guidance of military education among our officers have ventured further afield in the search for the lessons of other campaigns, men have felt the want of some book after the manner of that which Mr. Anderson has now written. It is a perhaps not wholly satisfactory feature of the increased demands of modern military education that we are now almost obliged to take some of our instruction in brief, absorbing more fully that which, at the moment, possesses the higher educational or examination value. As a *précis* this is thoroughly well done; the accounts of the different campaigns are not too much compressed, and yet nothing appears to be omitted which is necessary for the proper understanding of the course of the operations and their effect upon the result of the war, or even upon what was happening in other theatres. It is, perhaps, however, a matter for mild regret that, considering the French played a more or less leading part in every single one of the campaigns here described, the *précis* is, as stated by the author, based mainly upon French accounts. As a result the critical situation of the French at more than one period during the day of Eylau is, perhaps, hardly sufficiently pressed, and possibly some may wish that throughout the general view had not been so entirely French. The maps are numerous and excellent—as in all military works published by Messrs. Hugh Rees. One cannot but admit the utility, and even the necessity, of this study in brief of great campaigns, much as one may regret that the book supplies, perhaps, rather an examinational than an educational want.

The Records of the Rough Riders. By Captain H. G. McKenzie-Rew. Bedford: Brown and Wilson, 1907.

One can hardly have too many of these regimental records of the Boer War, since they constitute almost the only histories which will ever be obtainable of the inner and more personal story of that campaign. The writer has been met by the initial difficulty which has beset all those who have attempted to chronicle the part taken in the three years' war by mounted corps raised in England, or by local regiments recruited on the spot, for few, if any, of these were ever made use of as complete units, so that it is the histories of isolated squadrons and companies, distributed over a war area of extraordinary length and breadth, which has to be pieced laboriously together to make up the collected record of the regiment or battalion of

which they formed a part. The Rough Riders, or 20th Battalion Imperial Yeomanry, were the last to be raised of that contingent of 10,000 mounted men, which came into being in response to the appeal to the manhood of England, which resulted from the early reverses which befell British arms; its members were enrolled early in March, 1900, and by the middle of the following June, the different companies had all taken the field in South Africa. The recital of the war history of the Rough Riders deals for the most part with the life of the 78th Company, to which the author belonged, and which may be taken as typical of that of the 72nd, 76th, and 79th Companies, which helped to compose the 20th Battalion Imperial Yeomanry; it is a record of constant "scrapping," of hard fighting to and fro over the illimitable veldt, of sickness and exposure well and cheerfully endured, and will surely help to give stay-at-home Englishmen some conception of what those must accept who would help to bear the burden of Empire. For the Imperial Yeomanry in general, and for the Rough Riders in particular, such a work is invaluable, and, in the words of Colonel R. B. Colvin, C.B., who had the honour to command the corps, "this short history of the Rough Riders will revive memories already becoming dim; it will recall days which to many of us were the most eventful in our lives; bring back the faces of friends and comrades who have passed 'like ships in the night'; and also place on record the work done by a regiment, which, without any pretensions to fame, can truly assert that it faithfully served its country."

The book is adequately illustrated by a number of photographs, and sketches, and plans.

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The Austro-Russian War in Bohemia, 1866. By J. H. Anderson. 8vo. 3s. 6d. (Presented.) (Hugh Rees, Ltd.) London, 1908.

The Anglo-Portuguese Alliance and Coast Defence. By General J. E. de Morars Sarmento. Translated by Captain A. F. Custance. 8vo. 5s. (Presented.) (Hugh Rees, Ltd.) London, 1908.

England under the Tudors. By A. W. Innes. 8vo. 10s. 6d. (Methuen & Co.) London, 1904.

England under the Normans and Angevins. By H. C. W. Davis. 8vo. 10s. 6d. (Methuen & Co.) London, 1904.

The Tale of the Great Mutiny. By The Rev. W. H. Filchett. Crown 8vo. 6s. (Smith, Elder & Co.) London, 1907.

Records of the Seventy-Seventh (East Middlesex), The Duke of Cambridge's Own Regiment of Foot, now the Second Battalion the Duke of Cambridge's Own (Middlesex Regiment). By Major H. H. WOOLLRIGHT. 8vo. (Presented.) (Gale & Polden, Ltd.) London and Aldershot, 1907.

Jeziges Kriegs-Theater, oder Vorstellung derer Lager, Schlachten, Belagerungen, Marchen und andern Merkwürdigen Begebenheiten des Gegenwärtigen Krieges in Deutschland. Oblong Imp. 8vo. (Presented.) Augsburg, 1759.

Handbook of the Medical Services of Foreign Armies: Part I., France. (Official.) Crown 8vo. 6d. (Presented.) (Harrison & Sons.) London, 1908.

Reconnaissance in the Russo-Japanese War. By "ASIATICUS." Translated from the German by J. Montgomery, 3rd Hussars. 8vo. 4s. (Presented.) (Hugh Rees, Ltd.) London, 1908.

Cambridge Modern History, Vol. V.: The Age of Louis XIV. 8vo. 16s. (University Press.) Cambridge, 1908.

No. 95: Fire Fighting. By Lieut.-Colonel N. R. MCMAHON, D.S.O., Chief Instructor, School of Musketry. (Aldershot Military Society.) 1907.

Handbook of the Roumanian Army. Prepared by the General Staff. 12mo. (Presented.) London, 1907.

On War. By General CARL VON CLAUSEWITZ. Translated by Colonel J. J. GRAHAM. New Revised Edition. 3 Vols. 8vo. 21s. (Presented.) (Kegan Paul, Trench, Trübner & Co., Ltd.) London, 1908.

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Manual of Chiropody. By Captain M. L. HUGHES, R.A.M.C. Edited by Lieut.-Colonel W. DICK, R.A.M.C. (Official.) Pamphlet. 2d. (Presented.) (Harrison & Sons.) London, 1907.

John Law of Lauriston, Financier and Statesman. By A. W. Wiston-Glynn. 8vo. 10s. 6d. (E. Saunders & Co.) Edinburgh, 1908.

Treatise on Service Explosives. (Official.) 8vo. 1s. 6d. (Presented.) (Harrison & Sons.) London, 1907.

Special Signalling Code to be used by the Royal Garrison Artillery for Gun Drill and Practice only. 8vo. (Presented.) n.p. n.d.

The Campaign in Bohemia, 1866. By Dr. T. Miller-Maguire. 8vo. (Presented.) (Messrs. William Clowes & Sons, Ltd.) London, 1908.

Memoirs and Letters of the late Colonel Armine S. H. Mountain, C.B. By Colonel A. S. H. Mountain. Edited by Mrs. A. S. H. Armine. 8vo. (Longman, Brown, Green, Longmans & Roberts.) London, 1857.

History of the Warwickshire Yeomanry Cavalry. Compiled by the Hon. H. A. Adderley (Lieutenant W.Y.C.). 8vo. (Henry T. Cook & Son.) Warwick, 1896.

The Tactics of Home Defence. By Colonel C. E. Callwell. Crown 8vo. 3s. 6d. (William Blackwood & Sons.) London, 1908.

The American Civil War. By General E. P. Alexander. 8vo. 21s. (Siegle, Hill & Co.) London, 1908.

Some Neglected Aspects of War. By Captain A. T. Mahan, H. S. Pritchett, and Julian S. Corbett. Crown 8vo. 6s. (Sampson, Low, Marston & Co., Ltd.) London, 1907.

Stratégie Napolienne—La Critique de la Campagne de 1815. By A. Grouard. 8vo. 4s. 8d. (R. Chapelot et Cie.) Paris, 1904.

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From Keel to Truck — Dictionary of Naval Terms: English, French, German, Spanish, Italian. By Captain PAASCH. Oblong 8vo. 28s. (David Nutt.) London, 1908.

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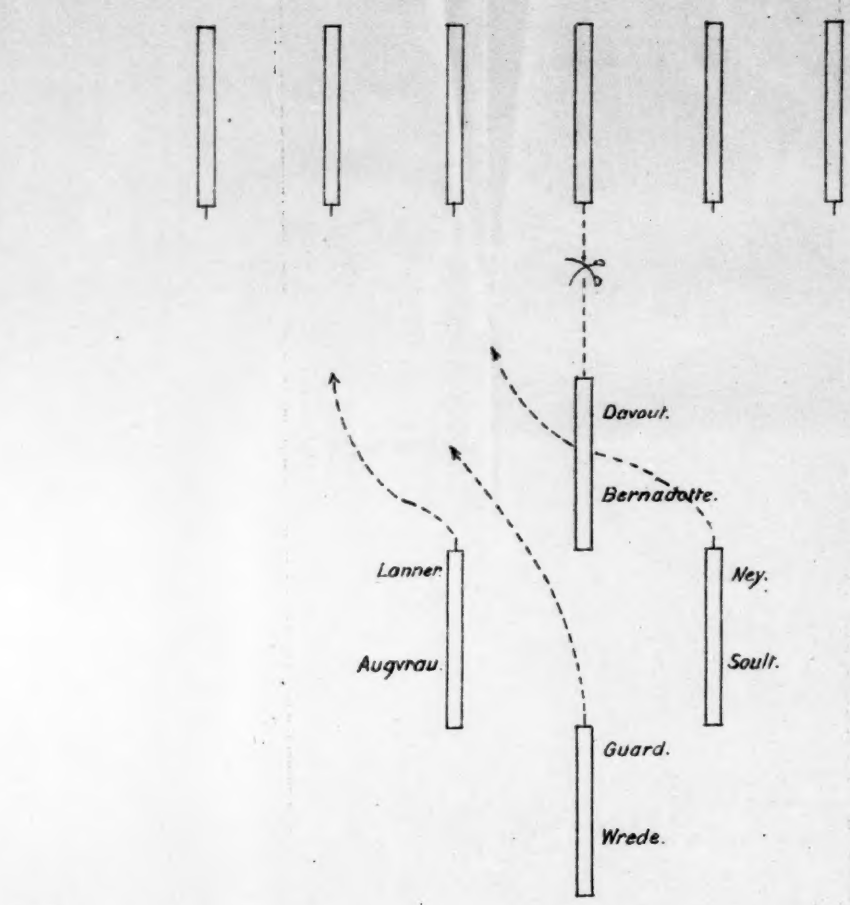

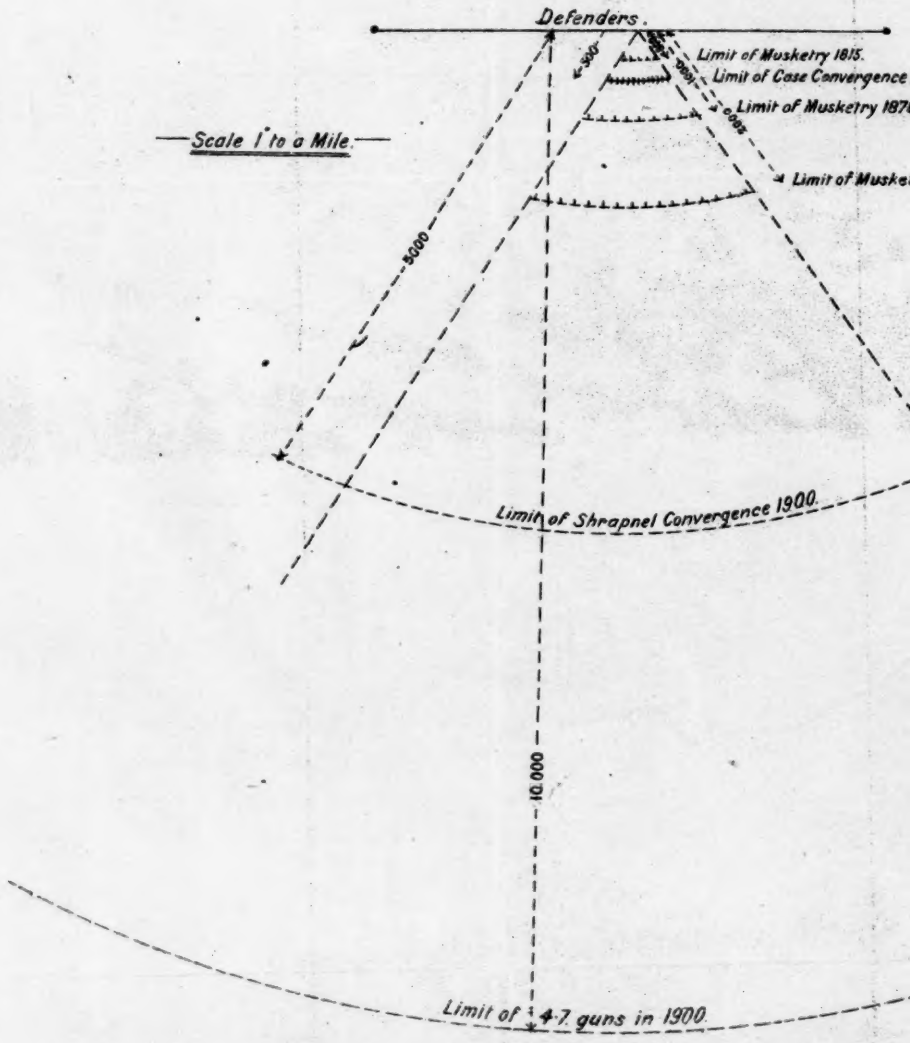

The advantages gained by increased range of weapons for attack will be seen in each case to b
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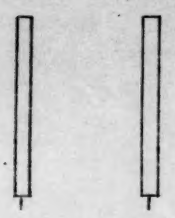

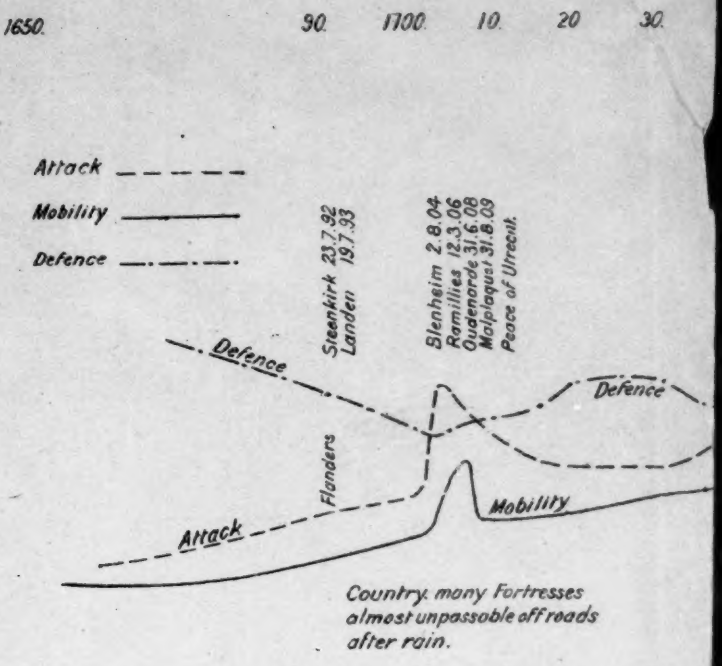

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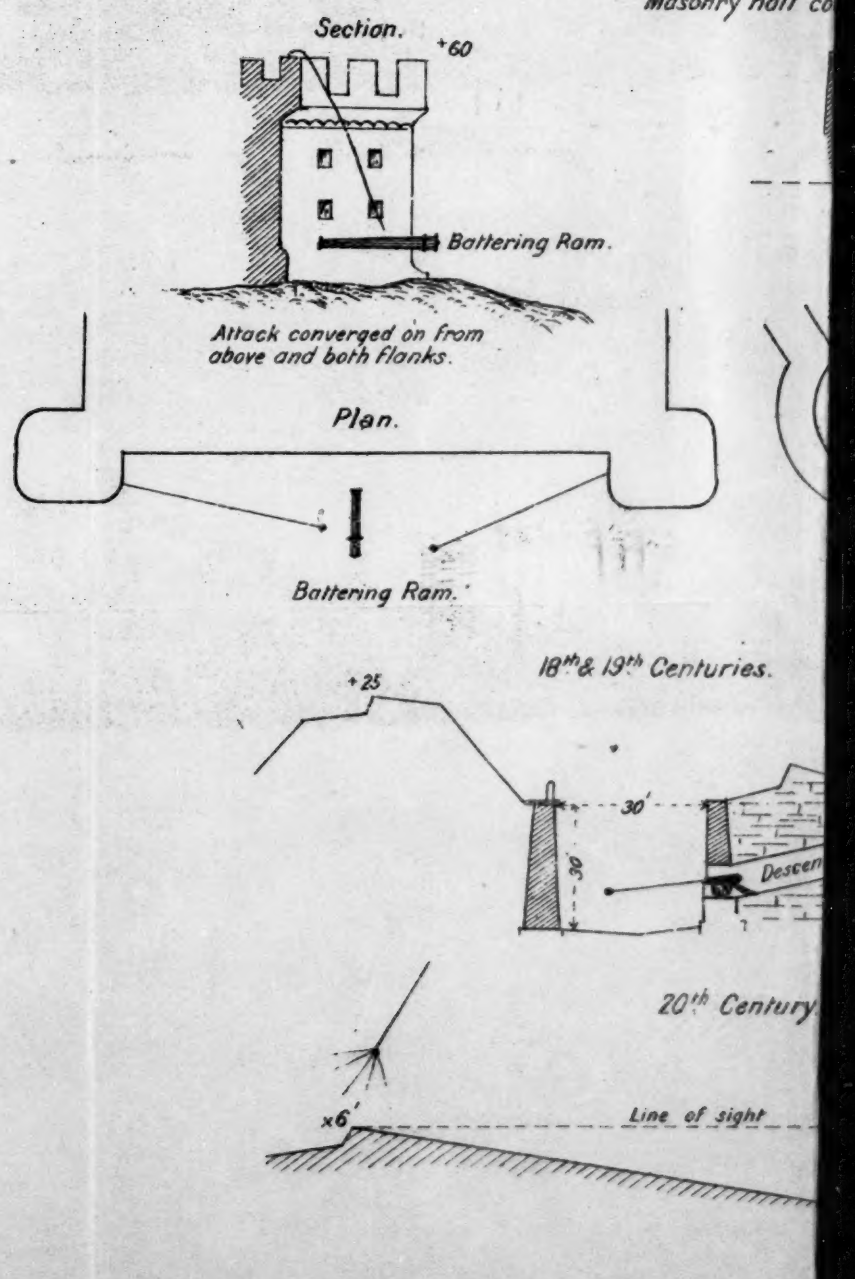

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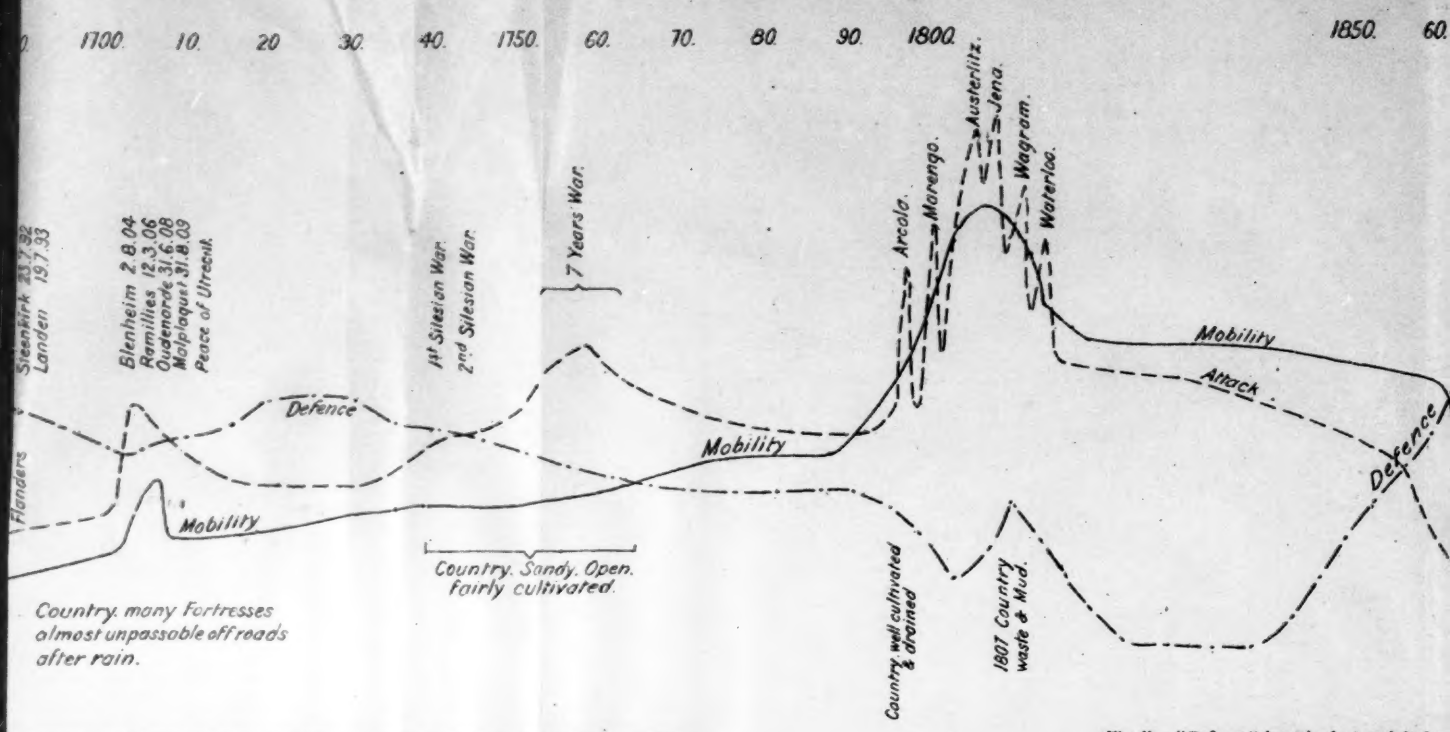

line marked "Mobility" indicates the difference of the mobility on either side, due to higher g, superior leadership, etc., added to the value of the factor itself arising from local conditions. s, nature of soil and fortresses renders it low. In Prussia, drier soil and no fortresses makes it uria, absence of roads and conformation of country north of the mountains renders it very

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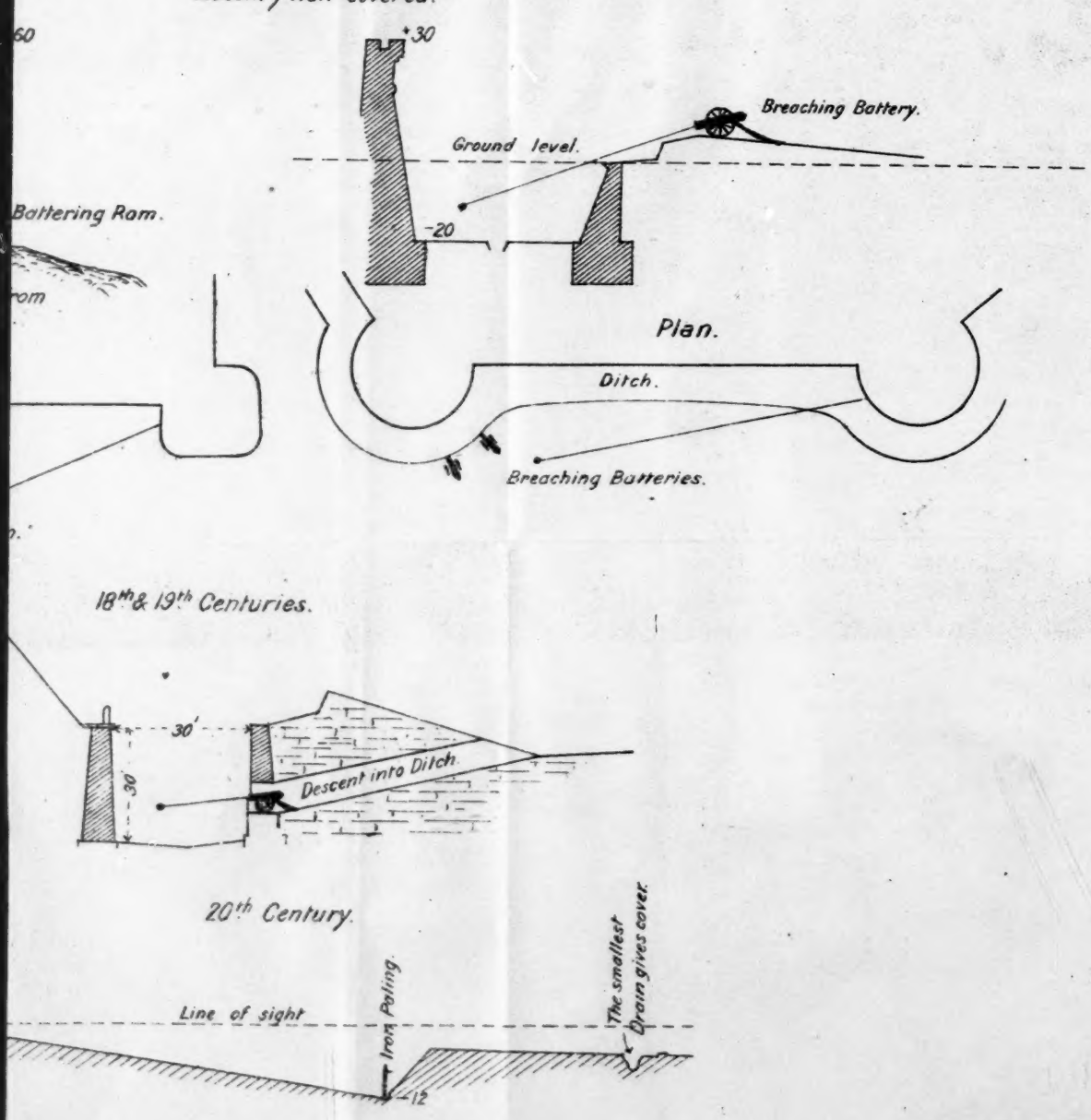
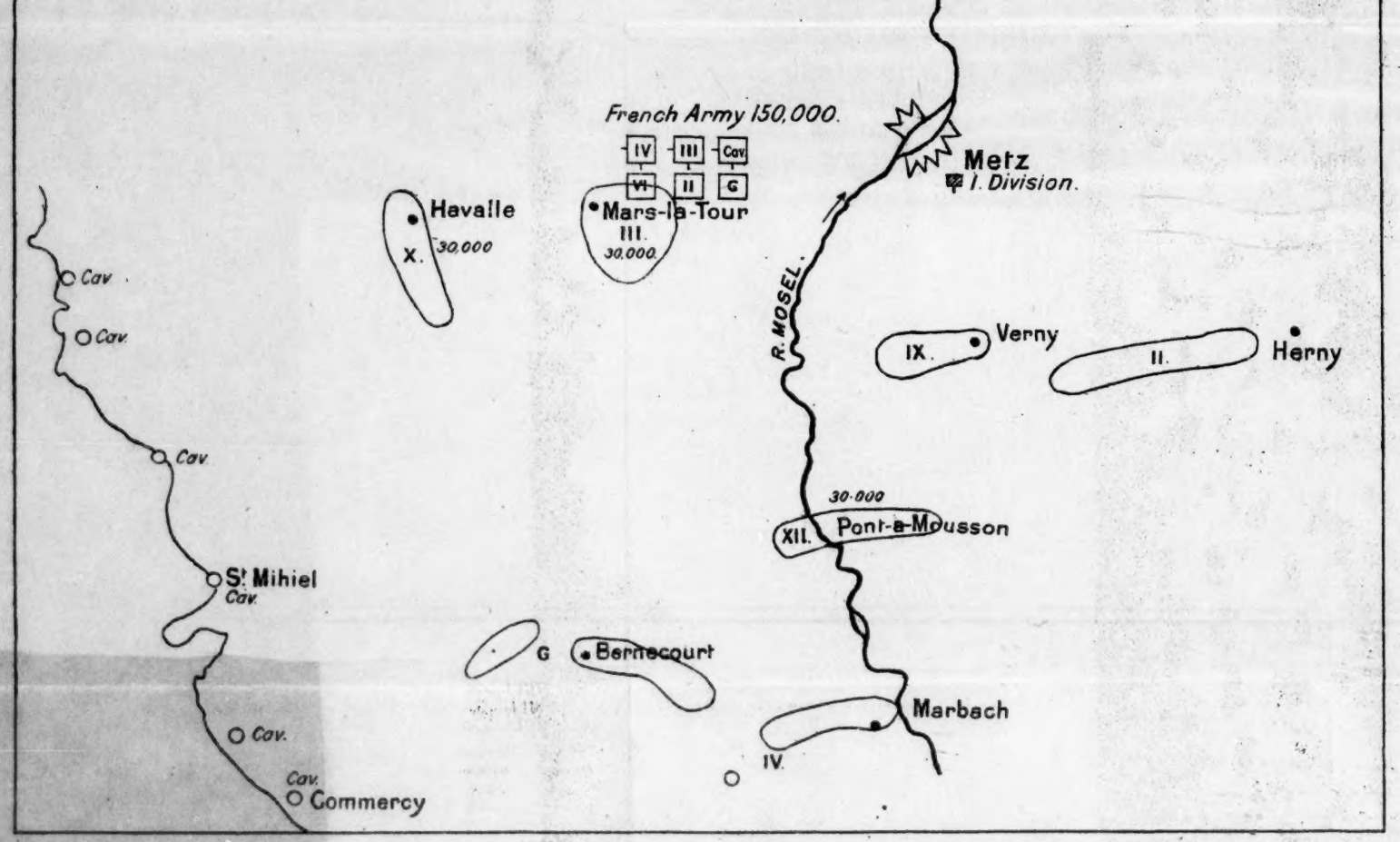
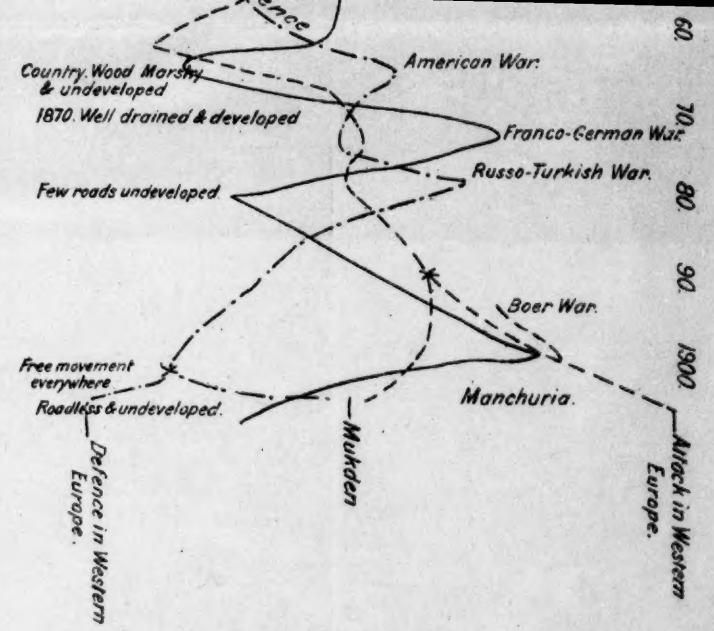
ATTACK AND DEFENCE—INFLUENCE OF TECHNICAL PROGRESS.







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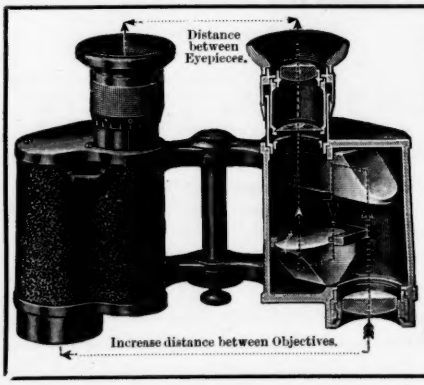

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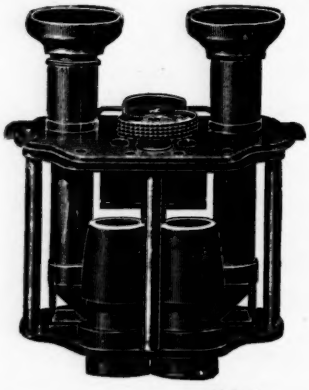

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